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AUTHOR Leiderman, Sally; Lah, David
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ABSTRACT

The California Conservation Corps (CCC), comprised of both residential and non-residential centers, was established in 1977 to conduct useful conservation work and provide youth between the ages of 18 and 23 with valuable work experience. This report uses data from 1983 and 1984 to assess the value of the work done by the CCC. It contains the following information: (1) a description of the CCC's projects; (2) an explanation of methods used for valuing work, with a discussion of the strengths and weaknesses of each; (3) the results of five different estimates of the value of CCC work, value/cost ratios, and an interpretation of findings; (4) conclusions and recommendations; and (5) a technical appendix describing the development of the willingness-to-pay estimate, derived from the environmental economics approach to valuing work, with a discussion of that approach. Findings of the five attempts to value the CCC's work were inconsistent, even when similar approaches were used. Estimates of the value of the CCC's work for the past several years ranged from approximately $16 million to $308 million. Value/cost ratios ranged from 0.60 to 7.0. The findings are controversial because: (1) none of the analyses is of the methodological or theoretical quality from which the evaluating agency would ordinarily draw firm conclusions; and (2) findings value the work much higher than that of other similar projects. (PS)

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The California Conservation Corps

Assessing the Dollar Value of Its Work

October 1985

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Public/Private Ventures

399 Market Street
Philadelphia, PA 19106
(215) 592-9099

The California Conservation Corps

Assessing the Dollar Value of Its Work

Sally Leiderman and
David Lah, joint authors

October 1985

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CONTENTS

Page

EXECUTIVE SUMMARY..... i

I. INTRODUCTION..... 1

II. CCC WORK PROJECTS..... 5

III. SUMMARY OF METHODS FOR ESTIMATING WORK VALUE.....11

IV. RESULTS OF ALTERNATIVE APPROACHES.....21

V. CONCLUSIONS.....37

REFERENCES.....45

TABLES

1. CCC WORK PROJECTS BY MAJOR CATEGORIES FY 1983-84.....5

2. FIVE APPROACHES TO VALUING CCC WORK AND CREATING BENEFIT/COST RATIOS.....23

3. ESTIMATED VALUE OF CCC WORK.....24

4. ESTIMATED VALUE/COST RATIOS.....25

TECHNICAL APPENDIX..... 49

EXECUTIVE SUMMARY

This report assesses the value of work done by the California Conservation Corps (CCC). The CCC is a state-operated program with the combined goals of conducting useful conservation work and serving youth. It is the largest and oldest youth conservation corps operating in the United States. The CCC is of particular interest to state and local service and conservation corps as a model for employment and training programs, and as a prototype for national service.

This study describes the CCC's work. It reviews various methods for valuing the work and presents several applications of these methods. The report is one in a series that Public/Private Ventures (P/PV) is preparing as part of an overall evaluation of the CCC program. Other reports in the series cover participant characteristics, program implementation, participant attrition, and participant outcomes. The overall evaluation of the CCC is a three-year effort funded by The Ford Foundation, The William and Flora Hewlett Foundation, the Charles Stewart Mott Foundation, and the State of California.

Each year, the CCC works on between 1,800 and 2,200 projects. During FY 1983-84, about 80 percent of corpsmembers' work hours were spent on assignments for sponsoring agencies; the remaining 20 percent were spent on capital improvements or program support for the CCC itself.

Most CCC work is done in crews with an adult supervisor, a corpsmember supervisor, and 10 to 15 corpsmembers. Their work typically involves conservation activities, ranging from major environmental enhancements to simple repairs and construction. During FY 1983-84, CCC projects included the following, listed in decreasing order of total corpsmembers hours: park development, forest improvement, conservation rehabilitation and construction, wildlife habitat improvement, water and soil conservation, response to emergencies, fire hazard reduction and energy conservation. Most of these projects were done for natural resource agencies, which supplied technical supervision, materials and supplies.

Valuing these work projects is of interest for two reasons: first, service to communities through productive work is a central goal of conservation corps; they need to point to the products and benefits of their work when accounting to funders, management and outside observers. Second, corps are relatively more expensive than other programs that serve youth of the same ages and backgrounds. In part, this is because of the high level of supervision required to do useful work. However, since additional benefits can be expected to accrue from this work, the

relationship between costs and benefits should be considered. Placing a value on CCC work is conceptually and operationally difficult since the public goods and services corps produce are inherently difficult to value. First, they are not transacted directly on the market, so there is no market price that can be used as a proxy for value. Second, even when a market price can be established -- such as the price another supplier would charge to do the same work, or the cost of a similar private good -- this price may capture only part of the product's value to society.

In economic terms, value to society (value-in-use) is comprised of value-in-exchange (market price) plus consumer surplus, the consumers' willingness to pay more than a market price. For goods and services for which there are few substitutes -- clean air and water for example -- consumer surplus may be quite high. The traditional measures that have been used to value work tend to equate value with market price. This may well underestimate value to society overall.

Operational problems are equally serious. First, corps work on projects that are difficult to group and categorize; even when categories can be made, each may comprise many discrete projects. Second, different methodological concerns arise for different valuation methods. Some are based on an analysis of program data and require careful record-keeping, including the ability to track end products as well as hours worked and other costs. Other methods supplement program data with original data collection that can be complicated and costly.

This report reviews seven methods for calculating work value within the context of these conceptual and operational concerns. The strengths and limitations of each are assessed. The seven methods reviewed are:

1. Documentation of work projects. Products are measured in terms of miles of trails cleared, numbers of trees planted, and so forth. This is a basic method for describing work accomplished, but it does not provide a dollar value. Although the method is relatively simple for small corps, it can be cumbersome for programs that do a wide variety of work. It can also be difficult to define the actual output or end product, particularly for a corps that works in combination with other agencies on a larger project.

2. Alternative supplier price. This method involves determining what another real or hypothetical supplier would charge to do the same work. Alternative prices can be calculated based on the number of hours spent to accomplish the work or

on the final product. The simplest forms of alternative supplier price methodologies are conceptually the least appealing. The more precise methods -- for example, using an outside contractor to estimate the final product's cost -- can be difficult or expensive. All forms of this method suffer conceptually in that they equate the value of work with its market price. They answer the question "What would it have cost to accomplish this work?" But they do not determine whether the work was worth doing nor how its value to society relates to its cost.

3. Work sponsors' estimates of value to society. Value is determined by project sponsors, who report the benefits of the work in dollar terms. The usefulness of this method depends on the questions asked and on how well sponsors are able to provide valid answers.

4. Fees received from cost-reimbursable work. The value of the work is assumed to be equal to what sponsors pay for it. This has conceptual appeal as a measure of market value when sponsors pay the whole cost of putting a crew in the field. Where corps subsidize this cost, however, the fees received will produce an artificially lower value, as opposed to what an alternative supplier would actually charge.

5. Quasi-economic studies. These studies attempt to put an economic value on public goods and services by linking their impact to some market transaction. Reforestation work is linked to the price of lumber, for example. The success of this method depends on how well the private good approximates the public good being valued. The approach is legitimately applied to some goods and services such as energy conservation or reforestation because few assumptions are required to translate the public into the private good. Usually these goods and services comprise only a small part of conservation corps work. Uncertain assumptions or leaps of faith are required to value most of the other goods and services that corps produce. These assumptions make calculations of value tenuous.

6. Environmental economics. Environmental economics a sub-discipline of public finance, is

concerned with valuing natural resources. Estimates based on the principles and techniques of environmental economics attempt to calculate value-in-use rather than value-in-exchange. Because the products of conservation corps are likely to produce substantial consumer surplus, assessing value-in-use may be a more appropriate overall measure of the value of these projects to society. Environmental economics methods may be difficult and costly to implement, and because they are relatively new, their results are generally interpreted as trends rather than specific values.

7. Ecological approach. This approach focuses on a program's impact on the natural environment of a state or local area. It usually requires the services of a professional ecologist. While this approach is useful for looking at the long term impact of projects and for setting program priorities, it does not result in establishing a dollar value. Thus, it must be used in combination with another approach to determine dollar value.

Several of these methods have been used to value the work of the CCC. This report presents the results of five studies, both in terms of dollar value and a value/cost ratio. The value/cost ratio compares the total value of the work for any given fiscal year with program and work sponsor costs for that year. It is used to control for differences in the types and numbers of projects and the level of program expenses across years. The five studies are:

1. A valuation of work that combines alternative price and quasi-economic methods. The estimates are taken from a 1980 study by Public Interest Economics --West (PIE-West) for FY 1978-79. The study found that value and cost were equal.

2. An updated version of the PIE-West study done by the CCC for FY 1980-81. The value/cost ratio was 1.39.

3. An estimate for FY 1983-84 based on work sponsors' sponsors' estimates of the alternative price to complete their projects. The ratio of value to cost was .60:1.

4. An estimate based on the same work sponsors' estimates of the dollar value of the benefit to

society produced by the project. The value/cost ratio ranged from 3.3 to .96, depending on whether or not one very high response was included.

5. An estimate for FY 1983-84 based on a demand function for California citizens, generalized from a willingness-to-pay survey of hikers, backpackers and fishermen. Value exceeded costs by seven-to-one.

The widely varying results of these studies are striking. All produced estimates of the value of the work that differed both overall and for individual categories of work. Even studies using similar approaches yielded differing results. Furthermore, all have either conceptual or methodological imperfections that make interpretation difficult.

Taken together, however, the studies indicate that:

1. The findings are extremely sensitive to the choice of methodology.

2. The CCC produces work of considerable dollar value, regardless of how it is measured.

3. Four out of five analyses suggest that the benefits from work alone are sufficient to offset CCC costs. If <u>all</u> program benefits and costs were measured, it is likely that the benefits from the total program would equal or exceed costs.

These findings are controversial in two ways. First, none of the analyses is of satisfactory quality. Four are based on existing data and one was based on a small, experimental survey whose limitations are noted in the report. The availability of these data allowed P/PV to broaden the number of analyses that could be reviewed, but the data quality could not be controlled.

Second, four of the five analyses of the CCC's work show values higher than one would expect, given the results of work value studies of other programs. In-program output by Supported Work and the Job Corps was valued by Mathematica, Inc., which established value/cost ratios of .66 and .27 respectively. A P/PV measurement of the value of work produced by its Ventures in Community Improvement (VICI) program estimated the value at .47 of costs.

None of these programs is directly comparable to the CCC. Although all three do productive work and provide services to

youth, two of them emphasize employability, personal development, skills training or remediation. Thus, one would expect them to produce less work and, hence, to have a lower ratio of work value to costs.

There is another explanation for why CCC work might be of greater value. Each of the prior studies used the alternative supplier price methodology to calculate value. This report is critical of that approach as a valuation tool because it may underestimate or overestimate the value of work to society. The alternative supplier price method answers the question "What would it have cost an alternative supplier to accomplish the same work?" Based on the five analyses reported for the CCC -- and the other studies of Supported Work, VICI and the Job Corps -- alternative supplier price methodologies appear to provide a lower estimate of value than other methods. This may be because the price an alternative supplier would charge is based largely on the tasks involved in doing the work -- not the value of the end product. Supported Work, the Job Corps, and VICI, like the CCC, generally do labor intensive work that requires large amounts of unskilled labor. For these kinds of projects, alternative supplier price may fail to capture the value of the work.

The report concludes with specific recommendations, as requested by the CCC, that suggest both routine and special valuation approaches.

I. INTRODUCTION

The California Conservation Corps (CCC) is a state-funded program that conducts conservation work and provides opportunities for youth development. The program operates as a department within the state Natural Resources Agency. In operation since 1977, the CCC currently has 18 residential and non-residential centers throughout the state, a full-time staff of about 386 employees, and an enrollment of 1900 corpsmembers between the ages of 18 and 23.

The CCC is of interest nationally as a distinctive model both for youth employment and training and for a possible national youth service corps. Because the CCC is the longest-operating -- and by far the largest -- youth conservation corps now in existence, it serves as an important example for other state and local programs.

This report examines the value to society of work accomplished by the CCC. It is one in a series of reports Public/Private Ventures will produce as part of an overall evaluation of the CCC. Other reports in this series include studies of participant characteristics, program implementation, participant attrition and participant outcomes. The overall evaluation is funded jointly by The Ford Foundation, The William and Flora Hewlett Foundation, The Charles Stewart Mott Foundation, and the State of California.

Assessment of the value of work produced by youth conservation corps efforts is relevant to public policy because these programs are expensive to operate. In part this is because they have dual goals -- the production of work products and youth development. In some instances in the past -- most notably concerning the Young Adult Conservation Corps and legislation to create an American Conservation Corps -- decisions have been made to discontinue or disapprove conservation corps programs because of their high costs. These decisions were not informed, however, by information about the benefits of these programs; the work accomplished and the gains achieved by enrollees may, in fact, offset program costs.

This review of valuation methods and analyses focuses on one aspect of the CCC's social benefits -- the dollar value of the work accomplished. Because work is a key feature of the CCC, P/PV felt it was important to look closely at the kinds, volume and value of work done.

This report does not present a benefit/cost analysis of the CCC. Such an analysis would consider all potential benefits -- to participants, to taxpayers and to society as a whole. An accounting of these benefits would include not only the dollar value of work accomplished, but also any increased earnings to corpsmembers either during or after their tenure in the CCC, decreased transfer payments, tax revenue generated by the increased use of facilities enhanced by the CCC, savings based on decreased criminal activity, and all other benefits that might reasonably be attributed to CCC operations. A benefit/cost analysis would also consider all program costs -- to taxpayers, work sponsors, participants and society at large. These costs would include the operating costs of the CCC and its work sponsors, opportunity costs for participants, and so on. Such an analysis is outside the scope of this research on the dollar value of the work.

Throughout this report, work value figures are presented in ratios that compare the value of work to the cost of producing it. These ratios -- labeled value/cost ratios -- look at only the particular subset of CCC benefits associated with work products. The ratios standardize findings across different program years by accounting for different levels of CCC program activity, as reflected in different levels of cost.

Although valuing the work of the California Conservation Corps is an important task, it is not an easy one. A number of methods have been devised to value the work that programs such as the CCC do. One method describes the work in a quantified form -- hours of emergency aid delivered, number of trees planted, miles of trail cleared. Others attempt to put a dollar value on the work -- based either on the market price of the output or the price another supplier would have charged to do the same work. Still other complex methods are based on surveying citizens or users of particular goods and services to determine their willingness to pay for the program's output. Each of these can produce some number to represent the value of the work. While each has some appeal, each method has shortcomings.

Most of the CCC's work creates public goods that are complicated to value because they are usually not transacted directly on the market. The value of a good exchanged in a market can typically be measured by its price because, in equilibrium, price generally approximates value. However, for non-market goods there is no price that can automatically be used to quantify value. In addition, even when certain market prices can be assigned (the cost of labor to the sponsoring agency, for example, or the price charged for a cost-reimbursable contract), these prices tie value to the cost of producing or purchasing a good, without measuring directly the value society places on it. When the market is operating in equilibrium, it can be argued that the price of goods

(value-in-exchange) is equivalent to the value to society (value-in-use). However, the existence of externalities or consumer surplus can make price a poor proxy for value to society. Where these occur (for example, goods and services whose price is constrained, public goods and services, or those with few substitutes), it can be argued that price does not indicate value to society.

Even if all of the conceptual concerns raised above can be addressed, methods to address them tend to be cumbersome and costly. The CCC completes about 2,000 projects each year. Each of these projects varies in its product, its complexity, its labor requirements and so on. No single method for valuing work will apply to all 2,000 projects. Further, the most precise methods rely on original data collection, such as independent estimates by alternative contractors or surveys of a representative sample of citizens. Many programs, including the CCC, would have difficulty justifying this as a routine expense.

This report uses several different techniques to estimate the value of the CCC's work. Each technique has its uses and its conceptual and/or implementation problems. The strengths and limits of each method are analyzed in this report.

Five different estimates of work value are presented. The first two are taken directly from previous work done by or for the CCC. The other three were prepared for this report, two from data collected by the CCC and one from an original survey conducted by P/PV. All five estimate the value of CCC work during a specified fiscal year. This report presents the total dollar benefit of the work and value of the work to the cost incurred by the CCC and, where appropriate, the cost to work sponsors, to produce it.

The five estimates of the value of CCC work and the five corresponding value/cost ratios are based on the following sources:

1. A 1980 study by Public Interest Economics-West (PIE-West). This study attempted to value CCC work in FY 1978-79 either by the price an alternative supplier would have charged for it or by the market value of the output.

2. A 1983 internal study of the CCC that updated the PIE-West study for FY 1980-81.

3. A questionnaire about work sponsors' estimates of the price an alternative supplier would have charged to complete the project. These data were collected by the CCC on a special form during FY 1983-84 and were analyzed by P/PV for this report.

4. A questionnaire about work sponsors' estimates of the project's value to society. These data were collected by the CCC at the same time as (3) above. P/PV prepared the analysis included in this report.

5. A survey of park users and salmon fishermen to determine whether and how much they would be willing to pay for goods and services produced by the CCC. Survey results are generalized to estimate the total use value (the area under the demand curve) for CCC goods and services among California citizens.

The fifth estimate applies the principles and techniques of environmental economics to the construction of a work value estimate. Over the past 20 years, environmental economics has evolved as a sub-discipline of public finance and has developed methods to estimate the value of non-market resources such as wilderness areas, clean air and water, and free-flowing scenic rivers. Most of the work projects the CCC conducts are on public lands and waters and, therefore, are non-market goods and services. Thus, environmental economics offers a useful method of valuation. Because this method is relatively new, and seldom used by programs to value their work, its use in this analysis is described in detail in a technical appendix to this report.

The remainder of the report is organized as follows: Chapter II describes the CCC's work; Chapter III summarizes methods for valuing work that have been used in the past, with a lengthy discussion of each method's strengths and weaknesses; Chapter IV presents the results of five different estimates of the value of CCC work, the resultant value/cost ratios and an interpretation of these findings; and Chapter V contains some conclusions. The technical appendix describes the development of the willingness-to-pay estimate derived from the environmental economics approach.

II. CCC WORK PROJECTS

The CCC works on 1,800 to 2,200 projects a year. All of these projects are related, in one way or another, to conservation of natural resources, enhancement of outdoor recreation areas, or preservation of historic sites in California. Some projects have statewide or regional significance; others are of local interest; a number are responses to emergencies.

Almost all of the CCC's work is done by crews. A typical CCC crew has an adult supervisor, an enrollee crewleader, and between 10 and 15 corpsmembers. In emergency situations, CCC crews from different centers work together under the command of a CCC work coordinator.

Virtually all CCC work projects are done for sponsoring agencies. In FY 1983-84, these projects accounted for about 80 percent of the hours corpsmembers worked. The other 20 percent of work hours were devoted to CCC program support or CCC capital improvement projects. The sponsoring agencies provide materials and supplies and technical supervision when needed and are responsible for project design. The CCC is, in most cases, a source of supervised labor to sponsoring federal agencies such as the U.S. Forest Service and National Park Service, to state and regional parks, and to state agencies such as the Department of Fish and Game and the Department of Forestry. Exceptions to this are projects involving CCC specialty crews in solar energy, weatherization and construction. In these projects, the CCC is a source of skilled labor and has somewhat the same role and responsibilities as a private contractor.

Table 1 breaks down CCC FY 1983-84 (July 1, 1983 to June 30, 1984) projects into major categories. Even within these categories, there is much diversity in the types of projects conducted.

Table 1
CCC WORK PROJECTS BY MAJOR CATEGORIES, FY 1983-84

	Hours	Percent
Park development	631,055	24
Forest improvement	458,296	18
Rehabilitation and construction	300,268	12
Wildlife habitat improvement	163,604	06
Water and soil conservation	139,600	05
Emergencies	127,476	05
Fire hazard reduction	123,986	05
Energy conservation	119,959	05
CCC program support	464,515	18
CCC capital improvement	58,602	02
	2,587,361	100

Particularly within park development and conservation rehabilitation, the CCC conducts a wide range of projects, varying both in level of skill and amount of time required to complete the work.

Park Development

Park development is a major CCC work activity, each year accounting for between an eighth and a quarter of total work hours. In FY 1983-84, the CCC worked with over 80 local and regional parks on an assortment of park development projects. The work included removing brush, constructing exercise stations, opening up unused areas of parks, planting trees, landscaping, helping to renovate and develop baseball fields, and helping to construct small outdoor amphitheaters. The CCC also worked last year in 18 state parks and recreation areas, assisting the park staff in general landscaping, brush removal and special small-scale construction projects. These special projects differed in each park, but included constructing 78 environmental campsites in one state park, installing solar water heaters in public showers in six state parks and beaches, constructing picnic tables, building concrete barbecue pits, and putting new wooden roofs on park buildings.

A major park development activity is trail maintenance. The CCC maintained 182 miles of trail in state and local parks and 283 miles of trail in national parks and forests in FY 1983-84. The CCC's trail maintenance activities include clearing fallen trees, constructing rock causeways across meadows, installing water bars for erosion control and constructing foot bridges. While the National Park Service has its own trail crews and the U.S. Forest Service and state parks sometimes have trail crews of their own, the CCC is a major provider of trail work that other agencies do not have the labor or the time to do themselves. Locations of CCC trail work include several state parks and national forests, as well as backcountry trails in Yosemite, Sequoia and King's Canyon National Parks. Backcountry trail work is one of the CCC's most lauded projects.

Forest Improvements

Last year, forest improvement projects represented 18 percent of the CCC's work hours. Most of these projects involve assisting the U.S. Forest Service, the U.S. Bureau of Land Management and the California Lands Commission in reforestation and timber stand improvement. The work comes from backlogs of projects identified by these agencies and has multiple objectives: producing trees to sell as lumber, improving wildlife habitats, enhancing the beauty of surroundings, controlling erosion and managing watersheds. In 1983-84, the CCC planted 583,000 trees on 1,500 acres of public land and assisted land management agencies to improve timber stands, including protection of seedlings. Since its

inception in 1977, the CCC has planted over 12 million trees in California.

Rehabilitation and Construction

The CCC assists local government and community agencies with small projects involving conservation, recreation and historic preservation. Such projects accounted for 12 percent of corps-member work hours in 1983-84. In a typical year, the CCC is involved in more than 100 such projects, ranging from two- or three-day assignments to extended commitments. Short-term efforts included preparation and cleanup of fairgrounds for three county fairs. Medium-term projects included helping develop or maintain bike trails in three communities, planting trees in six urban localities, landscaping around elementary schools and libraries in a number of communities, clearing vacant lots in central Los Angeles, and helping set up a tree nursery for the city of Ventura. Longer-term projects included restoring and repairing two historic barns in Northern California, building a security fence around the Battery Point Lighthouse as a first stage of eventual restoration, and building additional beach accessways in San Luis Obispo.

Wildlife Habitat Improvement

The CCC works with the California Department of Fish and Game (DFG) and the U.S. Forest Service on a number of wildlife habitat improvement projects. These projects usually account for about 5 percent of the CCC's work hours. In 1983-84, the CCC helped DFG on projects that included developing a game preserve in the East Bay area, clearing out an estuary in the Los Angeles region, building goose nesting boxes in Northern California, developing springs, fencing range, tagging fish, and creating brush piles to develop an edge effect for wildlife habitat.

By far the CCC's largest habitat improvement project is supporting a major DFG effort to restore salmon in Northern California. While DFG is the lead agency and work crews from other agencies are also involved, the CCC is an important source of labor for the project. In 1983-84, seven CCC crews worked full-time clearing streams and tributaries logjammed by years of lumbering, winter storms and floods. The CCC also helps DFG staff in activities to open up additional spawning areas for salmon and steelhead trout and increase their numbers in California rivers a ocean waters.

Water and Soil Conservation

In California, winter flooding often follows seasons of severe fires in the wildlands. After major wildland fires, the CCC

helps cities and towns susceptible to flooding prepare for winter storms. Activities include reseeding burned areas, constructing water- and mud-diversion devices, clearing drainage ditches and canals, and stabilizing slopes to prevent landslides. The CCC has also worked in selected California counties with the state Department of Conservation and other government agencies to plant windbreaks to limit erosion of soil by wind. The CCC also works to stabilize stream banks and clear debris left by winter storms. Such efforts both limit further erosion and protect watershed areas. Where possible, the CCC has made an effort to use native plants and shrubs in its revegetation projects.

Water and soil conservation work typically account for about 5 percent of the CCC's project work hours. However, the CCC's emergency responses to wildland fires, floods and winter storms also contribute to water and soil conservation in California.

Emergencies

Perhaps the work projects that generate the most pride -- and certainly the ones for which the CCC has received the most publicity and visibility -- are its responses to emergencies. The CCC legislation specifically states that fire prevention, fire suppression and disaster relief are to be major emphases of the program. Fighting fires and floods comprises most of the CCC's emergency response, but the corps also assists in special situations such as the Medfly infestation of California crops in 1981 and in various search and rescue operations. The CCC gives top priority to its emergency response work; the corps advises sponsors that it will stop work on projects to respond to emergencies.

The amount of emergency work the CCC does each year varies depending on the severity of the fire and flood seasons and the number of other emergencies that occur. In FY 1983-84, the CCC spent 127,476 corpsmember hours on emergency response, representing 5 percent of program work hours. In 1981, when California was faced with the Medfly infestation and a severe fire season, the CCC logged more than a million hours of emergency work.

The CCC is one of a number of agencies available to provide labor to the California Department of Forestry (CDF) and the U.S. Forest Service for fighting forest and wildland fires. The main sources of labor used by CDF to fight wildland fires are inmates and youth offenders in special fire corps run by CDF. The CCC supplements the 35 youth offender and inmate fire centers in the state with two CCC front line fire centers and nine other CCC centers that have trained fire crews available for emergency response. The CCC centers may be used by CDF and the Forest Service, depending on the location and magnitude of the fire. In a

typical year, the CCC responds to over 70 forest and wildland fires.

Much of the CCC's emergency flood work is done in the delta area of California. Within the delta are a number of islands that are below sea level, protected by a series of levees. The CCC is used in the delta when flooding is imminent. Corpsmembers assist flood reclamation districts and the state Department of Water Resources (DWR) by repairing failing levees and sandbagging when the river is at flood stage. The CCC also responds to flash floods in other areas of California.

The CCC also works with the Coast Guard and state and local emergency response agencies. In the last few years, the CCC has helped the Coast Guard clean up an oil spill near San Luis Obispo and helped save birds caught in another spill in the San Francisco Bay. The corps has also participated in search and rescue missions and responded to mudslides and landslides in the Bay Area and in Southern California. In emergency situations, the CCC is not the prime agency in charge, but a source of manpower to assist the principal emergency response agency.

Fire Hazard Reduction

The CCC also works with the California Department of Forestry, the California Department of Parks and Recreation, and the U.S. Forest Service on a number of projects to reduce fire hazards. These projects include creating or maintaining fire trails, clearing particularly flammable underbrush and monitoring controlled burns. These activities are conducted in parks and forests and near communities susceptible to damage from forest and wildland fires. In FY 1983-84, about 5 percent of corpsmember work hours were spent on reducing fire hazards.

Energy Conservation

Another point of pride for the CCC is its energy conservation work. One of the corps' 18 centers is devoted entirely to energy conservation. Residential corpsmembers at the Placer Energy Center are second-year enrollees with the rank of corpsmember specialist. When they first arrive at the energy center, corpsmembers work on labor-intensive projects such as weatherizing homes for low-income families, handling incoming calls for energy conservation hotlines and removing excess fluorescent lamps in state office buildings. More advanced corpsmembers at the energy center work on skill-intensive projects such as inserting timing devices for heating systems in state office buildings.

Crews from the Placer Energy Center conduct projects in all parts of the state, usually working out of trailers and vans. Accom-

plishments in recent years include the weatherization of more than 500 houses, the installation of solar water heating units in several state parks and state office buildings, and the completion of energy audits for more than one million square feet of state office space. Each year, energy conservation projects account for about 5 percent of all CCC work.

Program Support and Capital Improvement Projects

Last year, the CCC used 18 percent of corpsmember work hours for program support and another 2 percent for capital improvement projects. Program support activities include vehicle maintenance, tool care, cooking and kitchen help, facilities maintenance, carpentry, horticulture and clerical work.

Where possible, the CCC involves corpsmembers in capital improvement projects. For example, corpsmembers are usually used when the CCC moves into a new center that needs rehabilitation. In some instances, the CCC will negotiate free rent in return for rehabilitation, conducted in large part by corpsmembers. Corpsmembers were also used to construct the El Dorado Center, the only center the CCC has built from scratch. Corpsmembers also helped remodel the CCC headquarters building in Sacramento last year. The CCC involves corpsmembers in these capital improvement projects for a variety of reasons. They provide an efficient way for the corps to conduct capital improvements; they offer an opportunity for on-the-job training in construction skills; and they are a source of pride among corpsmembers and encourage the notion of self-sufficiency.

Summary

The CCC engages in a wide variety of work projects each year. These projects can be grouped into categories, but even within these categories there is much diversity in the type of work conducted. The CCC's work is almost always done in crews and, except for program support, is primarily conducted for other natural resource agencies that provide technical supervision as well as materials and supplies. Responses to emergencies are a special point of pride for the CCC.

III. SUMMARY OF METHODS FOR ESTIMATING WORK VALUE

Attempts to value the work of youth conversation corps are important to these programs for two reasons. First, external documentation of the value of program work output is necessary information for legislatures or other program funders. Second, internal information on the relative value of projects may be necessary for setting work program priorities.

Most of the work done by youth conservation corps programs is conducted on public lands and waters, for which no user fees are charged. Such fees would be a market transaction that could serve as a proxy for valuing the work and in their absence, it is inherently difficult to place a value on corps work. In this regard, youth conservation corps programs are no different from other public agencies such as the U.S. Forest Service, the U.S. Park Service, the Coast Guard and state natural resource departments.

This chapter reviews alternative methods for documenting the value of work done by youth conservation corps programs. Some of these methods can also be adapted to the valuing of human service work. In general, these alternative approaches are listed in ascending order of complexity. Advantages and disadvantages for each method are noted.

1. Documentation of Work Product

The most basic approach to showing the accomplishments of a work program is to document work products in detail. This approach requires that a completion form be filled out for each work project. Products are measured in terms of miles of trails cleared, number of trees planted, visitors assisted, square feet of facilities painted, etc. In turn, products are grouped under major categories such as reforestation, trail maintenance and park development.

As a complement to these data, corpsmember work hours can be documented for each project and aggregated by major work categories. The program will then be able to report not only the number of trees planted in a year or the miles of trails cleared, but also the corpsmember hours spent to accomplish these tasks. Hours can then be aggregated to describe the amount of park development, reforestation and other major categories of work. Thus, corps can collect data to describe the volume of work they do, the types of work activities and the results of the work.

An advantage of this approach is that it allows a program to show its work accomplishments at the end of each year. For small

corps, or those that work on only a few types of projects, collecting data to describe work activities is fairly straightforward. Data describing work accomplished can be collected as a routine part of developing or completing a project. Hours are fairly easily tracked by linking time sheets to work projects. For programs such as the CCC, however, data may be more difficult to obtain since the CCC works on as many as 2,200 projects a year. Because of the diversity of these projects, they can be difficult to describe and to group into homogeneous categories. The kinds of categories that have been used -- park development, wildlife habitat improvement -- generally contain hundreds of distinct work products, each of which may be quantified into different units of measurement. Aggregating either within or across categories will necessarily be imprecise.

This method provides information in a form that clearly demonstrates what the program has been doing with its work time. The Civilian Conservation Corps, the Youth Conservation Corps (YCC), the Young Adult Conservation Corps (YACC) and the California Conservation Corps have all used this approach when presenting data in annual reports.

One concern with this approach is that it requires careful record-keeping and a consistent system to identify work projects and measure their output. This problem will be more serious for programs like the CCC that do many different kinds of projects. Measurement of output can also be difficult when valuing services rather than goods and/or when the corps is not the sole producer. In such cases, it is difficult to identify in a tangible way the corps' exact contribution.

Finally, by itself, documenting projects does not describe the value of the work. It is neither an economic nor ecological study of a corps' work efforts. For example, a corps can document the number of trees planted by a program, or the hours spent working in a day care facility, but this does not address the economic value of these goods and services to society, nor their longer-term ecological or other effects. While documentation can be used to describe the kinds, volume and products of work done by corps, another valuation method must still be used to move from these data to the dollar value of the work. For this reason, documentation should be considered a basic tool that all corps could adopt to describe their work efforts. It is also a necessary -- but insufficient -- element of a valuation system.

2. Alternative Supplier Price

The most commonly used approach to placing a value on the work projects of conservation corps programs is the use of alternative supplier prices. This is a method of valuing work based on what another real or hypothetical supplier, other than the supplier being measured, would charge to accomplish the same work. This

method has been used by the YACC, YCC and CCC. It has also been used by Mathematica to estimate the value of work conducted by youth employment programs funded under the Youth Employment and Demonstration Projects Act (YEDPA) and to estimate the value of work conducted in the Supported Work demonstration. It has also been used by P/PV to estimate the value of work completed in the Ventures in Community Improvement demonstration (Zimmerman and Masters, 1978; Kemper and Long, 1981; Wolf, Kelley, Smith and de Lone, 1982).

There are a number of alternative supplier price methodologies. Some are more appealing than others. One approach is to calculate value by assigning a dollar value to the hours a corps spends on a project. This assumes that the corps produces hours of work -- that its output is labor. For reasons that will be noted, this assumption weakens the defensibility of the alternative supplier price approach. A better approach is to calculate value by determining what another real or hypothetical supplier would actually charge to accomplish the same end product. This calculation can take into account the quality of the finished product and the efficiency with which another supplier would complete the work. It may be based on the same, fewer or more hours, depending on what the estimator feels would actually be the case.

Three methods based on labor are assigning minimum wage to value the hours that corpsmembers worked, using prevailing wage rates to vary the value of hours by the type of work, and adjusting either of these calculations by work sponsor costs, overhead and other costs incurred by the corps or the sponsor to accomplish the work. All of these approaches assume that the output is labor, not the product of that labor. Although they may vary the dollar amount used to calculate value, they all assume a linear link between hours and value, putting a higher value on the work the longer it takes to do it. For some labor intensive activities -- emergency flood control and personal services to homebound individuals, for example -- methods that build value from hours of corps labor may be appropriate. However, where the corps produces a product, the amount of labor expended to produce it can be irrelevant to its value.

A different, and more appealing, kind of alternative supplier price approach is to base the price on what it would cost to achieve the end product independent of the number of hours the corps spent. There are two variants of this method. An outside estimator can be asked to establish an alternative price, or the work sponsor can be asked to estimate how much it would have cost for an organization other than the corps to reach the same end point. When work sponsors provide estimates, they may also take into consideration whether they would have incurred more or less internal cost when using the alternative supplier.

These methods have in common the basic conceptual underpinning of the alternative price methodology -- that the value of the work is reflected in the cost of doing it. The methods within alternative supplier price differ in the precision with which one calculates the cost of doing the work. The simplest and easiest methods are also the least accurate. The most precise method -- having a work sponsor or outside appraiser set the alternative price -- can be difficult to implement.

To produce accurate estimates, work sponsors and outside appraisers need a lot of information about accomplishments and work sponsor costs. Before work sponsors can provide estimates, they usually need help sorting through this information. Outside appraisers, who may be more accustomed to doing this kind of valuation, must be hired and managed. Further, because of the great number and diversity of CCC work projects, a method has to be developed to sample from among projects and then to generalize to the whole. This kind of sampling is very difficult because of the heterogeneity of the work even within categories.

These are some of the operational difficulties associated with using alternative price methodologies. In theory, all of these problems could be overcome given sufficient expertise and money. The main disadvantage of the alternative price methodology, however, is conceptual, not operational. It concentrates on the price or cost of producing a product, while ignoring the value society places on it. On the one hand, a good or service may have no value to society whatsoever -- digging a hole and filling it up again, for example -- yet it is still possible to come up with a substantial value based on alternative supplier prices. On the other hand, a good or service may be very inexpensive to produce but be of great value to society.

This criticism of the alternative price methodology is not purely academic. At congressional hearings, the Department of the Interior has discounted the credibility of YACC work value figures because they were based on the alternative price methodology and did not reflect whether the work was worth doing. Conceptually, alternative supplier price is a measure of relative efficiency, not a measure of the product's value to society.

3. Work Sponsor Estimate of Value to Society

Another possible approach to estimating work value is to include a question on project completion forms asking work sponsors to estimate the value to society of the work completed. The CCC included such a question on project forms during 1983 and 1984. An advantage of this approach is that work sponsors are experts in their fields and are intimately familiar with the work project. A disadvantage of this approach is that a sponsor has few guidelines on which to base a judgment. Asking work sponsors how much they would be willing to contribute, as private citizens, to

the project would at least give sponsors a basis for answering the question. Even then, a sponsor might be biased in favor of work in his field and thus not representative of the larger population.

When the CCC included this question on project completion forms, fewer than one-third of the work sponsors responded. The responses received varied from benefit estimates that were 35 times greater than project costs to benefit estimates of 1/18 project costs. (See Chapter IV for a discussion of results from this survey question.)

4. Fees Received from Cost-Reimbursable Work

Most conservation corps programs conduct at least a few projects each year for which they are reimbursed by the sponsoring agency. These reimbursements take on the appearance of private market transactions, and it has been argued that it is possible to value a project by looking at the amount of the cost-reimbursable contract.

An advantage of such an approach is that it is based on objective data. Clearly, if work sponsors are willing to pay a set amount for conservation corps work, then it must be worth at least that much to the sponsoring agency.

The main problem with this methodology is that, like the alternative supplier price methodology, it bases the value of the work on its cost. Youth conservation corps are attractive to sponsoring agencies precisely because they generally do not charge the full cost of putting a crew in the field. Most corps that receive fees from contracts also obtain funds from other sources and subsidize the cost of the crew in order to be competitive. Were it not for the youth corps, the sponsoring agency would probably have to pay more for the work. Thus, estimates based on fees received from cost-reimbursable work are generally lower than alternative supplier price estimates.

5. Quasi-Economic Studies

In this approach, attempts are made to put an economic value on corps-produced goods and services by linking the impact of some specific activity to its closest market transaction.

The goods and services produced by the CCC lie along a continuum. At one end are privately transacted goods and services such as energy/solar work, whose worth can be measured directly by its transaction value -- dollar savings in energy costs. At the other end are public goods and services that are never transacted on the market -- park development and reforestation, for example. Most of the CCC's work falls at this latter end of the continuum. Quasi-economic studies deal with public goods and services. They

try to find some privately transacted good or service to use as a proxy for valuing work. The success of these studies depends on how well these private goods and services approximate those being valued. The PIE-West study of the CCC and an internal study conducted by the CCC provide examples of this approach. (See Chapter IV for their results.) These studies estimate the value of the CCC's salmon restoration work by predicting a price for each salmon thought to be produced, and estimate the value of the CCC's reforestation work in terms of the discounted price of lumber.

An advantage of such an approach is that it has some legitimacy in its attempt to estimate market prices for work products. One shortcoming of this methodology, though, is that in many cases it lacks conceptual appeal. The value to society of reforestation or salmon restoration, for example, goes beyond merely looking at prices of lumber or salmon.

A second disadvantage of this approach is that it often requires strong assumptions about the amount of output produced by the work that is being examined. For example, it is very difficult to estimate the increased number of salmon that will result from stream clearance work aimed at long-term habitat improvement.

In general, each youth conservation corps program will conduct some work projects -- reforestation is a good example -- whose products are somewhat amenable to being valued using the market price of similar goods. However, such projects usually represent a relatively small proportion of all work done by conservation corps. The effort to attach a market price to conservation corps products can be stretched to cover any conceivable work project undertaken. The more the methodology is stretched, though, the more the conceptual appeal is lost and the stronger become the assumptions required to reach a market price.

In special cases, the products of youth employment programs either are or could be transacted in the marketplace. For example, some components of the Supported Work demonstration produced manufactured goods, and Mathematica was able to use the market price of these goods to determine the value of work produced in these components of the program. The energy conservation work of the CCC is similar to services provided by private contractors, and it is possible to estimate the value of the work either by looking at the prices charged by private contractors or the savings in energy costs. However, these products represent only a small proportion of the work done by youth conservation corps.

6. Environmental Economics

Environmental economics is a sub-discipline of public finance designed to value natural resources and activities relating to

preservation rather than development of natural resources. In recent years, environmental economists have conducted research on a variety of preservation-versus-development issues, including those surrounding the Alaskan pipeline. Environmental economists have developed a number of methods for placing values on natural resources -- including travel cost techniques, contingent valuation surveys and hedonic price indexes. (See the technical appendix for a more in-depth discussion of these techniques.) These methods aim to determine the willingness of individuals to pay to support preservation or enhancement of natural resources. Hedonic price indexes measure the value of changes in one or several dimensions of a resource. While travel cost techniques were originally developed to value a complete entity -- a park or lake, for example -- researchers in this area are working on the problem of valuing specific attributes, rather than the whole.

Youth conservation corps typically contribute to the enhancement of an existing facility; they neither develop new resources nor are the sole provider of services within an environmental project. Therefore, the corps' contribution must be carefully defined before it can be measured accurately. Contingent valuation surveys provide a method of doing this. For this reason, they tend to be the environmental economic method most applicable to valuing conservation corps work. Often, surveys in environmental economics are set up in a referendum format. A respondent has the chance to vote yes or no to preserving or enhancing a resource at a given cost.

For a variety of reasons, the techniques of environmental economics are more applicable to youth conservation corps than to traditional youth employment and training programs. Conservation corps tend to work on distinct projects with identifiable products; conservation corps projects are done in crews, rather than by dispersing enrollees in internship positions with other agencies; and the beneficiaries of youth corps work are more clearly identifiable than the beneficiaries of the work done by traditional employment programs. However, the success of these methods depends on how well one can describe the product of the corps. While this may be easier for corps than for other employment and training programs, it is still not a simple task.

An advantage to using a method based on environmental economics is that it is grounded in economic theory and economic literature. It aims specifically at the value to society of non-market goods and services.

A disadvantage of this approach is that it is difficult to implement. First, the method requires complicated and expensive survey design, sampling, data collection and analysis. Corps work has to be described to respondents so they understand what they are being asked to measure. Care must be taken to word these descriptions so as to avoid bias; convey the exact, and sometimes

limited, contribution of a corps to a whole project; illustrate the great variety of work corps do; and place the corps' marginal contribution in perspective. These are not easy requirements to meet. Second, samples for contingent surveys should fairly represent the larger group to whom willingness-to-pay will be generalized. When the larger group is all state citizens, as it is for the CCC, sampling will be complicated and expensive. Third, contingent surveys measure what people say they will pay, not actual payments. Thus, findings may include various kinds of response bias. Finally, sophisticated statistical analyses are required to produce findings. All of this can be difficult and costly for corps to do with their own staff.

Another limitation of this methodology is that environmental economics is not an exact science. Because public goods are not transacted on the market, it is inherently difficult to value them. In surveys, respondents may underestimate or overestimate their willingness to pay for a good or service. Also, in the case of youth conservation corps programs, respondents may have difficulty separating the contribution of the program being studied from that of other natural resource agencies. While surveys can be carefully designed and worded to minimize such problems, estimates derived from an environmental economics study should be seen in terms of the broad direction of the value of a resource, rather than precisely what the true value is.

7. Ecological Approach

An ecological approach forsakes efforts to put a dollar value on the work of a conservation corps program, but instead focuses on the impact the program has on the natural environment of a state or local area. Such a study is ideally done by a professional ecologist; it assesses where and how the program had significant impact on the ecological health of an area and where it did not.

A shorthand attempt to conduct an ongoing evaluation of a conservation corps' work program would classify each completed project according to the ecological impact of the work. For example, a three-tiered system could be set up in which Class I projects had little or no lasting ecological benefit; Class II projects were of peripheral ecological value (such as cabin construction, trail maintenance, park development); and Class III projects addressed central environmental concerns (such as reforestation, salmon restoration and fire emergency work). The Zimmerman and Masters study done by Mathematica includes a variation of this method for general employment and training programs -- ranking projects as having low, intermediate, or high economic value.

An advantage of an ecological approach is that it naturally reflects the legislative goals for most conservation corps programs. Such a study is also useful -- much more so than any of the previous approaches discussed -- in helping set internal

program priorities for work efforts. A disadvantage is that an ecological study can be time-consuming and can require consultation by professional ecologists. Equally important, an ecological study does not result in a dollar value of the work. Thus, even after an ecological assessment, a program still would need to conduct another study to assign work values.

Summary

Of the seven approaches to analyzing the value of work done by conservation corps programs, two -- documentation of work projects and the ecological approach -- are useful for describing work but do not assign a dollar value, so they cannot be used in developing cost-benefit ratios. The other five -- alternative supplier price, work sponsor estimates of value to society, fees received from cost-reimbursable work, quasi-economic studies, and studies based on environmental economics -- can all provide a dollar estimate for the work accomplished. These dollar estimates, however, are not conceptually equivalent.

Value to society (value-in-use) is comprised of value-in-exchange plus consumer surplus. Value-in-exchange is reflected in the market price of a good or service. Where consumer surplus is minimal, value-in-exchange will approximate value to society at the margin. However, where consumer surplus is great or where there are external factors that push the market out of equilibrium -- for example, in the case of goods and services for which there are no ready substitutes -- value to society could be much greater than value-in-exchange.

Public goods and services are difficult to value for two reasons. First, they are generally not transacted directly on the market. Thus, it is difficult to measure their value-in-exchange. Second, even where proxy measures for value-in-exchange can be determined (the cost of producing the work, or the price for a similar product transacted as a private good or service), these valuations do not account for externalities or consumer surplus. These can only be included by looking directly at society's demand for the good or service or by adjusting the market price to reflect market disequilibrium.

Two of the methods for valuing work presented here -- alternative supplier price and fees received from cost-reimbursable work -- equate value with the cost of doing the work. Quasi-economic studies attempt to measure value-in-exchange by finding a private good that approximates the public good being produced. These methods are based on what it would cost a work sponsor to accomplish the same amount of work or what the product of that work would bring in the marketplace.

In contrast, the environmental economics approaches and the work sponsor estimates of value to society attempt to measure value-

in-use. They avoid some of the conceptual shortcomings of the other methods. At the same time, they have serious methodological difficulties that make them hard for corps to use. They require precise presentation of the work being valued, careful data collection procedures and, often, sophisticated sampling, design and analysis. Because of this, they may not be useful to corps for generating work value information on a routine basis.

As should be clear from this discussion, there is no method for valuing work that is simple, inexpensive and precise. As will be seen in the next chapter, the results of work valuation studies are highly sensitive to the method that is used. Thus, corps must first choose the conceptual question they wish to pose and then select the best method to answer it given their resources and expertise.

IV. RESULTS OF ALTERNATIVE APPROACHES

This chapter reviews the results of five studies or analyses of CCC work value. Each produced estimates of value for various categories of CCC work, as well as a value/cost ratio using those estimates. The value/cost ratio compares the total value of the work for any given fiscal year with associated program and work sponsor costs for that year. It is used to control for differences in the types and numbers of projects and the level of program expenses across years. Two of the five studies were prepared for this report; the other three are earlier work done by or for the CCC. The five analyses include:

1. A valuation of work that combines alternative price and quasi-economic methods. The estimates are taken from a 1980 study done by PIE-West that looked at benefits and costs for FY 1978-79.

2. An updated version of the PIE-West study done by the CCC for FY 1980-81.

3. An estimate based on work sponsors' estimates of alternative prices to complete their projects. Data come from a form distributed to work sponsors by the CCC during several months in FY 1983-84.

4. An estimate based on work sponsors' estimates of their projects' value to society. Data come from the same form described in (3) above.

5. An estimate based on a demand function for California citizens generalized from a willingness-to-pay survey of hikers, backpackers and fishermen.

These five analyses represent a number of different approaches to calculating work value -- two forms of alternative supplier price methodologies, one based on the value of labor and one on the value of the product; quasi-economic approaches; an estimate by work sponsors of the value of work to society without reference to its cost; and the use of environmental economics techniques to estimate a demand function for CCC goods and services based on the willingness-to-pay of one group of users. Each of these methods has been described and its general strengths and limitations discussed.

This chapter will describe particular cases in which these methods were used to value CCC work and will compare the value of

work done with its costs to the CCC and work sponsors. If the resulting ratio is one or greater, the value of the work done by the CCC exceeds the costs of the program. If this is true, then the CCC can be said to "pay for itself" solely on the basis of the work it accomplishes. Other economic benefits to corpsmembers or communities (increased wages or taxes, for example), are not included in the calculation of benefits. Where such benefits exist, they would increase the benefit side of the equation, although they might be offset by increased costs (e.g. opportunity costs to corpsmembers for participating in the CCC). If the value/cost ratio is less than one, however, it means that work output alone does not offset costs. (This is typically the case for those employment and training programs where the actual work produced is a by-product, not a central goal of the program.) It may be the case that the benefits to corpsmembers, in combination with the work accomplished, would be sufficient to justify the program on economic grounds alone. However, the analyses reported here do not address that question.

Results from the five analyses are presented in the tables and the remainder of this chapter. Table 2 summarizes differences in the methodology of the five analyses. Table 3 presents the estimates of value by work category. Table 4 shows value/cost ratios using these estimates.

Within each analysis, the method chosen is first briefly laid out. Then, the application of the method to a calculation of work value is presented. Next, the cost calculations are described and assessed. The results, both for the value of the work and in a value/cost ratio, follow. Because the fifth analysis is based on a less frequently used approach, and because it was designed and implemented solely for this report, its methodology is described more extensively in a technical appendix to this report.

1. PIE-West Study

Public Interest Economics-West (PIE-West) conducted a study in 1980 to estimate the value of the CCC's work for FY 1978-79. This study used a form of the alternative supplier price methodology for some categories of work and quasi-economic approaches for others. For the purpose of estimating value, the study separated work into four categories. The largest category accounts for 87 percent of corpsmember hours. It aggregates work into the following categories: rehabilitation and construction, forest fire control and emergency response, energy/solar work, and wildlife habitat improvement and erosion control. For these activities, PIE-West viewed the CCC as a provider of supervised labor. They calculated work value based on an alternative price to supply the hours of labor spent by the CCC.

Table 2

FIVE APPROACHES TO VALUING CCC WORK AND CREATING VALUE/COST RATIOS

Study/ Analysis	Time Period Covered	Data Source	Calculation of Value	Calculation of Costs
1. PIE-WEST	FY 78-79	CCC records	CCC viewed in some cases as a supplier of labor and in others as provider of product. Combination of alternative suppplier price and quasi-economic methods.	Costs based on CCC program costs for FY 78-79 with some adjustments. Work sponsors' expenses not included.
2. CCC Replication of PIE-WEST Study	FY 80-81	CCC records	General approach same as PIE-WEST, although some categories of work treated differently.	Costs based on all CCC program costs for FY 80-81. Work sponsors' expenses not included.
3. Work Sponsors' estimates of supplier price	FY 83-84	Project evaluation form filled in by work sponsors	Based on work sponsors' estimates of costs of completing the same work using another or real or alternative supplier. Includes work sponsor benefit expenses.	Costs based on all CCC program costs for FY 83-84 plus work sponsors' expenses.
4. Work Sponsors' estimates of the benefits to society	FY 83-84	Project evaluation form filled in by work sponsors	Based on work sponsors' estimates of the dollar value of project benefits.	Costs based on all CCC program costs for FY 83-84 plus work sponsors' expenses.
5. Demand for CCC goods and services based on willingness-to-pay survey	FY 83-84	Survey of hikers, backpackers and fishermen; state recreation surveys	Estimates of value based on willingness to pay for various categories of CCC work, based on referendum question. Survey responses generalized to all hikers, backpackers and sport fishermen in CA.	Costs based on all CCC program costs for FY 83-84 plus work sponsors' expenses.

Table 3

ESTIMATED VALUE OF CCC WORK
(in millions of dollars)

	PIE-West	CCC Study	Work Sponsors' Estimates of Alternative Supplier Price	Work Sponsors' Estimates of Value-to-Society	Willingness-to-Pay Survey
1. Park Development	$ 2.0	$ 5.8	$ 6.8	$ 5.3	$ 31.0
2. Forest Improvement	1.4	2.8	7.1	7.7	41.0
3. Rehabilitation and Construction		8.8	2.8	3.0	28.0
4. Wildlife Habitat Improvement/Water and Soil Conservation	12.1	.5	1.4	1.7	45.0
5. Emergencies a. Emergency Responses			2.8	118.3	31.0
b. Fire Hazard Reduction		26.4	3.5	2.8	36.0
6. Energy Conservation		1.7	.9	4.0	6.0
7. Salmon Restoration	.6	2.0	.7	1.2	4.0
Overall	$16.1	$48.0	$26.0	$144.0	$308.0

Table 4

ESTIMATED VALUE/COST RATIOS

	PIE-WEST	CCC Study	Work Sponsors' Estimate of Alternative Supplier Price	Work Sponsors' Estimate of Value-to-Society	Willingness-to-Pay Survey
1. Park Development	2.13	1.02	.66	.51	4.00
2. Forest Improvement	1.74	1.20	.77	.84	4.00
3. Rehabilitation and Construction	.76	.71	.55	.60	6.00
4. Wildlife Habitat Improvement/Water and Soil Conservation	.76	1.16	.49	.61	15.00
5. Emergencies					
a. Emergency Responses			.48	.20	5.00
b. Fire Hazard Reduction	.76	2.37	.57	.45	6.00
6. Energy Conservation	.76	2.21	.43	1.81	2.00
7. Salmon Restoration	.17	1.16	.32	.58	20.00
Overall	1.00	1.39	0.60	0.96 - 3.30	7.00

The actual calculation consisted of multiplying the hours worked in these activities by the cost of labor, supervision and transportation, based on prevailing wage rates in the State of California for general labor crews ($8.73 per hour in FY 1978-79). PIE-West then generalized this figure for all work categories where the alternative price method was applied. Quasi-economic approaches were used to value the remaining categories -- forest improvement, salmon restoration and park development. For these categories, the study attempted to assign market values to the output. PIE-West evaluated the CCC's reforestation work from discounted prices of lumber, estimated stream restoration work as a function of the number and price of extra salmon produced, and estimated park development activities as the value of recreational days prescribed by the U.S. Water Resources Council.

None of the estimates of value that were used is entirely satisfactory. Using the price of labor as a proxy value is one of the weakest forms of the alternative price methodology, as noted in Chapter III, because it assesses alternative price solely by considering the number of program hours involved (labor), not the hours it would take another supplier to do the work, nor the price another supplier would charge for the same end product. It may be that the CCC spends a great many hours to accomplish a project of no benefit or few hours to do a very important task. Using hours as the sole determinant of value assumes a consistent link between the time it takes to do something and its value, a link that may not exist. Beyond that, assigning a single price for labor to projects representing 87 percent of CCC work probably misses important variations in actual alternative prices, because of the considerable heterogeneity in CCC work.[1]

The quasi-economic approach used to value the rest of CCC work requires assumptions that link the work activity with a market product. The most conceptually appealing of these is linking the price of discounted future lumber sales to the value of the CCC's reforestation work. Even so, there is little way of knowing how many trees planted by the CCC will be harvested. Further, lumber prices only partially capture the value of forests to wildlife, erosion control, water resources and enhancing scenic beauty.

The assumptions required to link stream restoration work to the number and price of additional salmon are even more strained. Any estimate of salmon produced per mile of stream cleared must be highly tenuous. Moreover, the notion of valuing stream

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[1] PIE-WEST noted these limitations in its report. They point out that 1) not all of the CCC's work is amenable to economic valuation, 2) the estimates are a "partial accounting of CCC program benefits," and 3) because not all benefits are measured, "the true economic value of this work could be two to three times greater" than the figures presented here.

clearance in terms of an average value per fish is not particularly appealing. Most game fishermen go fishing for a variety of reasons -- including the outdoor experience, companionship, solitude -- and while catching more fish may enhance a fishing trip, sport fishermen do not usually judge their fishing experience in terms of dollars per fish caught. While doing so does allow one to calculate a market price for stream clearance work, intuitively this seems to miss some of the benefit of the work.

To value park development, the study applied a standard value for recreation user-days. The accuracy of the park development valuation rests on the validity of this figure. The U.S. Water Resources Council has established guidelines that, in a benefit/cost analysis of a recreation resource that has not been the focus of a user survey, a figure between $.50 and $2.50 can be used for the value of a recreation user-day. The PIE-West Study took four park projects of the CCC, assigned a middle-range value of $1.50 per recreation user-day to the parks, and multiplied this by the number of visitors to the parks. They then subtracted the annual maintenance costs of the parks to come up with a net value to society.

If CCC park development projects created new parks, then the use of the value of a recreation user-day would be a reasonable method to calculate the value of the work. However, most of the park development work done by the CCC enhances existing parks. Thus, the benefit that accrues to the CCC is only a proportion of the value of a recreation user-day. Given that the CCC often does quite minor work at parks, using the whole value of a recreation user-day overestimates the benefit of this work.

PIE-West calculated costs by apportioning CCC program costs in FY 1978-79 across work categories, based on corpsmember hours expended in these activities. The additional costs of CCC fire centers that support Department of Forestry personnel rather than the CCC were excluded. The full cost of CCC vehicle and equipment purchases was not included, but was amortized over several years. In addition, work sponsor expenses were not included in costs.

For the purpose of the value/cost ratio, it would be more conceptually consistent to include work sponsor expenses in the calculation of costs where quasi-economic methods were used, since the value of a final product is being estimated. The benefit from this product would include the benefit derived from the work sponsor's efforts. Since these expenses are on the benefit side of the equation, they should properly be on the cost side as well. Since the alternative supplier price method looked at the work only as labor, work sponsor expenses are missing from both benefits and costs. It would only be proper to consider them in the calculation if there were either cost savings or additional expenses incurred by using the CCC rather than some other vendor.

To summarize, the PIE-West study estimated work value from a combination of alternative supplier price and quasi-economic approaches. Benefits may be underestimated in several categories in which only the cost of labor and supervision are considered. Costs are underestimated for the three categories of work in which quasi-economic approaches were used to determine value. To be consistent, work sponsor expenses should be added to costs for these categories. Without the original data, it is impossible to recalculate value/cost ratios with these changes. Thus, we cannot determine whether or how findings might change. For FY 1978-79, PIE-West calculated value from CCC work at $16.1 million and costs at $16.19 million for a value/cost ratio of 1.0. Value exceeded costs for the three categories of work where quasi-economic valuations were used -- reforestation, salmon restoration and park development. All of the other work done by the CCC that year was worth a total of $12.1 million, or about three-fourths of what it cost the CCC to accomplish this work.

2. 1983 CCC Replication of the PIE-West Study

In 1983, the CCC updated the PIE-West study for FY 1980-81. Like the earlier study, this analysis used a form of alternative supplier price to value some categories of work and quasi-economic methods to value others. The CCC used alternative supplier price for two of the seven work categories. These two categories -- construction/rehabilitation and emergency response -- accounted for two-thirds of the CCC's work hours that year. Quasi-economic methods were used to value four categories -- park development, forest improvement, wildlife habitat improvement and salmon restoration. The value of energy conservation was taken as the dollar amount of estimated cost savings.

Different labor rates were used for the two categories of work valued by alternative price methods. Construction and rehabilitation were valued by the CCC exactly as in the PIE-West study, using prevailing rates for general labor crews. To estimate the value of its forest fire control work, the CCC study used prevailing wage rates of firefighters in the Department of Forestry.

The CCC study used the same quasi-economic estimating techniques as PIE-West for reforestation (discounted sales of lumber) and salmon restoration (number and price of extra salmon per mile cleared). For park development, the CCC study assumed that a park's value was $.50 per user-day without the CCC, and $2 per user-day after the CCC completed its work. This $1.50 increase in value was then multiplied by total visitor-days to derive an overall estimate of the value of CCC park development work.

This CCC study raises the same conceptual and operational concerns as the PIE-West study. While the CCC study improves on the alternative supplier price approach by using discrete wage rates

for different categories of work, it still assumes that the value of the work is equal to the cost of production labor, without considering either the value of the end product or the labor hours another supplier would have spent. The quasi-economic estimates based on discounted lumber sales or additional salmon require the acceptance of uncertain links between work and market transactions. Finally, the assumption that CCC work creates a standard $1.50 increase in park user value per day seems particularly arbitrary.

In calculating the value/cost ratio, work sponsors' expenses were not included in program costs for FY 1980-81. Although it would have been more precise to include these expenses for those categories where a final product was being valued (reforestation, salmon restoration and park development), those categories together are a relatively small proportion of corpsmember hours. Adding sponsor costs would not significantly change the overall results.

The CCC determined that benefits for FY 1980-81 were $48.06 million, while costs were $34.50 million. This produces a value/cost ratio of 1.39.

The CCC determined that value exceeded costs in six of the seven categories that were valued. In two of these -- energy/solar work and forest fire control -- value exceeded costs by more than two-to-one. In the other five, benefits equaled or slightly exceeded costs. Benefits were estimated to be about three-fourths of costs for construction and rehabilitation.

3. Work Sponsors' Estimates of Alternative Supplier Prices

The CCC collected data relevant to work valuation on a special form during several months in 1983 and 1984. The form included a question that asked work sponsors to estimate the alternative cost of completing the project. It explicitly stated that sponsors should include their own expenses in the alternative cost estimate. This question differs conceptually from the alternative price estimates reported earlier, because the CCC is viewed as producing a product, not as a supplier of supervised labor. Thus, the value is based on an estimate of the alternative price to accomplish the task, not to provide a certain number of hours of work.

Two hundred thirty-one forms were collected from CCC project files; responses to the alternative supplier price question were given on 211, representing about 10 percent of CCC work projects completed during FY 1983-84. These responses were divided into various categories of work and generalized to the whole category on the basis of corpsmember hours.

In 20 cases, the estimate of alternative supplier price was less than or equal to the estimate of the work sponsor's expenses. Since work sponsors were directed to include their expenses in the alternative supplier price, these responses indicate a misunderstanding of the question, and were deleted. The analysis is based on the remaining 191 forms.

This method is, in theory, a more appealing application of the alternative supplier price approach. This is because work sponsors were asked to consider what another supplier would have charged to complete the same project considering their own and the supplier's total expenses. Unfortunately, the data were collected by means of a self-administered form. In addition, work sponsors did not always know all of the project's cost elements. Thus, while asking sponsors to provide alternative prices seems like a good way to get this information, in fact the responses varied so widely from the CCC's cost of completing the project as to seem questionable. One way to improve the validity of these responses would be to use a personal interview, not a self-administered form, and to assist work sponsors in thinking through all the details of providing an alternative estimate.

Costs were calculated from FY 1983-84 program costs of $34 million. Costs for each category were based on the proportion of CCC work hours spent doing that kind of work, plus a prorated share of corpsmember work hours spent on capital improvement and program support. CCC training hours were allocated to wildland fire control and general emergency response categories only, since most of the CCC training was geared to emergency preparation. Added to these costs were estimates of work sponsor expenses available on the data collection forms. These expenses were estimated to be $9.6 million for FY 1983-84.

The alternative supplier price analysis found benefits of $26 million, compared to costs of $43.6 million. The value/cost ratio was less than one for every category; the overall value/cost ratio was .60.

4. Work Sponsors' Estimates of the Value of the Work to Society

Using the same form described for study (3) above, the CCC collected data from work sponsors on their estimate of the value to society of the project the CCC did for them. Sponsors were asked to list benefits of the project to the environment, the public or the economy in measurable terms such as increases in park visitor-days or energy savings in BTUs or kilowatt-hours. Sponsors were then asked to translate this benefit, wherever possible, into dollar amounts.

Seventy-four of the 231 forms, fewer than 30 percent, contained an answer to this question. Benefits were estimated by dividing these responses according to work categories and then generaliz-

ing to the whole category on the basis of corpsmember work hours.

Asking work sponsors to estimate the value of their work to society has some appeal. Work sponsors are generally knowledgeable about their field and are intimately familiar with the project that was done. Thus, they understand exactly what it is they are being asked to measure. Unfortunately, response rates were so poor that one can have little confidence that data represent all projects sampled. The question itself was also difficult to understand. Work sponsors were asked to state the benefit of their project in units that could be converted to dollar values. They were not told whether they should be thinking in terms of the market value of the project (value-in-exchange) or their own or society's willingness to pay for it (value-in-use).

It is hard to know how to aggregate the responses, since no consistent measure is applied. Further, there is no theoretical basis for generalizing the work sponsors' responses to some larger population. If work sponsors had been asked to consider their own willingness to pay for the work, then their responses might have been considered representative of a knowledgeable subset of California residents. If they had been asked to estimate market value, then their responses could have been generalized to all work projects, as was done in the first three studies.

Costs were determined as they were for the third study. Costs were distributed to work categories on the basis of corpsmember work hours for FY 1983-84. The 18 percent of corpsmember hours spent for program support and capital improvement were reallocated to the remaining categories of work. Training hours were split between the two emergency response work categories.

The sponsors estimated the value of the CCC work for FY 1983-84 to be $144 million, against costs of $43.6 million. This very high value figure included one sponsor's estimate of $725,000 for a relatively small CCC emergency project. Because it was one of only two estimates in that category, it received much weight in the calculation of overall value. We did not exclude this estimate from the analysis since it was one of only two work projects in its category for which estimates were provided.

With this response included, the overall value/cost ratio was 3.3. Without it, the value/cost ratio drops dramatically to .96. Value exceeded costs for only two categories of work -- energy/solar work and emergency response. However, because of the very small number of responses used for this analysis, we have little confidence in these results.

5. Demand for CCC Work Based on Individuals' Willingness-to-Pay

The estimate presented in this section is based on the principles and techniques of public finance and environmental economics. (The general principles on which the approach is based and the methodology are reviewed in the preceding chapter and the technical appendix.) It attempts to estimate a demand function for CCC goods and services as a function of the willingness-to-pay of hikers, backpackers and salmon fishermen; this provides an estimate of value-in-use.

To calculate the demand function, a survey was constructed that required respondents to vote either to fund or not to fund each of eight categories of CCC work. Each vote was couched as a referendum in which respondents were presented with a specific tax increase to support or reject; the dollar amount of the increase was varied across respondents.

Ideally, such a survey would have involved in-person interviews of the general population, but such a survey was beyond the scope of this study. As a proxy, interviews were conducted with a small number (212) of hikers and backpackers at three parks in California. Their willingness to pay for CCC park development, reforestation, emergency response, conservation and rehabilitation, forest fire control, wildlife habitat improvement and erosion control work was generalized to all hikers and backpackers in the state of California, based on the number of such persons reported in a 1978-80 state recreation survey. Another survey of 151 fishermen was made to determine willingness-to-pay for salmon restoration work. These results were generalized to the total population of sport fishermen in the state, based on the 1980 National Survey of Fishing, Hunting and Wildlife Associated Recreation, conducted by the Bureau of the Census for the U.S. Fish and Wildlife Service.

The demand for CCC work was estimated from the survey respondents' willingness-to-pay, generalized to all California citizens. There were three steps to this generalization. First, the willingness-to-pay was calculated just for survey respondents. Then, these responses were generalized to the whole population of California residents who hike, backpack and fish, based on the numbers of such people reported in the state surveys. Finally, it was assumed that the demand for CCC goods and services among all other California residents was zero. In effect, this means that the state-wide demand is based only on the demand among the 17 percent of California residents who report that they hike, backpack or fish. This conservative approach may help to compensate for the fact that the respondents were not selected at random from the population as a whole.

This approach has some conceptual appeal, in that it attempts to measure value to society without reference to the cost or price

of the work. This seems to be the most appropriate way to value public goods and services that are not transacted directly on the market. Difficulties in implementation -- some inherent in the method -- mean that the results should be interpreted broadly.

There are four implementational concerns. First, individuals' willingness-to-pay is dependent on the exactness of their under standing of the issue. We believe that the way CCC activities are described affects whether or not respondents report they would vote yes to an increase in taxes to pay for this work. Because much of it enhances existing facilities, it is difficult to describe the CCC's contribution exactly. CCC work activities were described to respondents much as they are described in Chapter II of this report. We are not certain that these descriptions were adequate to make individuals understand the relatively small role the CCC plays in park development, reforestation, and so on.

Second, the sample was small and not selected at random from some larger group. Only about 400 people were surveyed from a population of hikers, backpackers and sport fishermen. Further, the probability of selection cannot be calculated. Respondents were chosen from people who happened to be at trails and streams on the days the survey was being conducted. They are not representative, nor were they chosen from a known universe. Some evidence suggests they are avid recreationists, compared to the general population of hikers, backpackers and salmon fishermen. While the analysis found that sample characteristics -- age, income, number of times hiking -- were not generally important in predicting responses, one would still have much more confidence in the results if the sample were larger and more representative of the population to which it was generalized.

Third, respondents were presented with eight separate referendum questions. The questionnaire did remind respondents to "make sure that the sum of the individual increases....is not more than the total amount you would be willing to pay each year to support the CCC." Many respondents also asked if they should consider the total tax increase for which they were "voting," and they were told they should. However, it can still be speculated that some respondents failed to sum their responses, so that they did not consider trade-offs or their own budget constraints.

Fourth, the approach used here tapped respondents' stated willingness-to-pay, not their actual behavior. There is a tendency for respondents to provide socially desirable responses to survey questions. For most park and water users, it can be assumed that conservation is generally considered a desirable activity. Thus, it is possible that the responses to the referendum questions reflect a positive attitude that may or may not be consistent with

behavior.[2] Some forms of the alternative price and quasi-economic approaches are actually stronger in this regard, since they can be based on actual market behavior.

Costs were calculated exactly as described above for the analysis of work sponsors' estimates. Costs for each category were based on corpsmember hours for those activities, plus a prorated share of program support, capital improvement and training hours. Work sponsors' estimates of their expenses were included where appropriate.

The willingness-to-pay survey found a total value of $308 million as compared to total costs for FY 1983-84 of $43.6 million ($34 million in CCC program costs and $9.6 million in work sponsors' expenses). The $308 million assumes that every hiker and backpacker in California was willing to pay an average of $108 in increased taxes or user fees for CCC work, each salmon fisherman was willing to pay an extra $5 above the existing $10 fishing license fee to support CCC salmon restoration work, and all other citizens of California were willing to pay nothing.

The overall value/cost ratio was 7.0. Willingness to pay for individual categories created value/cost ratios that ranged from 20 for salmon restoration work to 4 for both reforestation and park development. (Energy/solar work had a value/cost ratio of 2. However, this ratio was based on actual cost savings, not on the willingness-to-pay survey.)

These results are much higher than those derived from the other analyses and seem startling. In fact, the sampling and response issues discussed earlier reduce one's confidence in the exact dollar values presented. At the same time, there are reasons to expect the value to be produced by willingness-to-pay to be higher than that of other approaches. Willingness-to-pay measures value-in-use, not value-in-exchange. Value-in-use captures value-in-exchange as well as external factors and consumer surplus. If consumer surplus is very high, as is quite possible, then value-in-use ought to be greater than value-in-exchange. Put another way, respondents were asked to report their willingness-to-pay for CCC goods and services that may actually be very highly valued by them. In fact, respondents reported that they were willing to pay substantial amounts of money for the goods and services described as the CCC's contribution to parks, streams, forests and the like. Finally, there are a great many users of parks and waters in California. Each one would have to

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[2] This is a general concern of survey research, and one which users of contingent valuation surveys have addressed. A number of studies exist in environmental economics that test for such biases. To date, these studies have found some evidence, not great, of response bias.

value CCC services and products only a little in order to produce an aggregate value much greater than CCC and work sponsor costs.

Summary

This chapter presents results from five different studies assessing the value of work done by the CCC. The results vary tremendously. All studies produced different estimates of the dollar value overall and for specific categories of work. In addition, no type of work is consistently ranked high or low across all five studies. Furthermore, all have either conceptual or methodological imperfections that make estimates questionable.

There are two reasons for the wide variation in results. The first is that the methods do not measure the same thing. The first three analyses used alternative supplier price or quasi-economic techniques and are attempts to measure the price or cost of the work or its end product: value-in-exchange. The fourth and fifth studies are based on estimates of the value of work to sponsors or users, independent both of its cost and of what the product would fetch on the market: value-in-use. Thus, one would not expect to see similar results across both sets of studies.

Results also vary because of the unevenness with which each approach was implemented. Response rates and sample sizes are a problem for three of the approaches. Three require conceptual leaps of faith that make findings tenuous. Finally, three different approaches to calculating costs in the value/cost ratios were used. For all these reasons, direct comparisons across the studies are impossible.

While it is difficult to have confidence in any one estimate, taken together, they suggest that if one were to do a benefit/cost analysis, work would contribute a substantial amount to the benefit side of the equation. Because of this contribution, and considering other potential benefits and costs, it is likely that total program benefits would at least equal, and probably outweigh, total CCC costs.

V. CONCLUSIONS

This report has described the work of the CCC, reviewed seven different methodologies for valuing it, and presented the results of five different analyses in which some of these methods were applied. The methods generally measure one of two concepts -- either value-in-exchange (market or transaction value) or value-in-use (the value to society directly). Each method and each application raises theoretical or implementational concerns. No method emerges as the best. However, some are clearly conceptually stronger or more feasible than others.

Each year, the CCC works on about 2,000 different projects. These vary from major environmental projects to small-scale improvements to existing buildings, parks, streams, etc. These projects are difficult to value for several reasons:

- They are public goods and services which are not, by and large, transacted on the market. Therefore, there is no market price that can be used as a measure of value.
- Even where market prices can be approximated, they may measure only a subset of value to society.
- The number and diversity of CCC projects mean that no single method for valuing work will apply to all categories of work or to all projects in a single category.
- All of the methods traditionally used, as well as newer ones, have conceptually and/or methodological shortcomings.
- The simplest and least expensive methods are the least precise; the most conceptually appealing methods are expensive and difficult to implement.

Results from the five attempts to value the CCC's work are inconsistent. Findings are different, even when similar -- though not exactly comparable -- approaches were used. Estimates of the value of the CCC's work for the past several years ranged from a low of approximately $16 million (based on an alternative supplier price approach applied to a smaller program year) to a high of $308 million (based on an estimate of the demand for CCC goods and services derived from a willingness-to-pay survey of hikers, backpackers and fishermen). Value/cost ratios, used to control for different budgets, types of projects and numbers of projects across years, ranged from .60 to 7.

Three findings emerge when all of the analyses are considered together:

1. The value placed on the CCC's work -- and the work of any youth service or conservation corps -- is extremely sensitive to the choice of methodology. Approaches vary in how they define the product of the corps, whether they value it according to a proxy market price or its value to society independent of a market price, and in the precision of the calculations. Each of these factors affects the dollar value that will result.

2. The CCC does work of considerable value. All of the analyses found that the CCC does millions of dollars worth of work each year.

3. Because of the limitations of each analysis, there is no single dollar value of the work that emerges from this research. However, all but one of the calculations show that the work done by the CCC creates value equal to or greater than CCC costs (and, where appropriate, work sponsor costs) for a given program year. This is true for analyses that look at value-in-exchange as well as those attempting to measure value-in-use. Because the CCC has dual goals -- it produces work and also provides benefits to corps members -- work is only one of the factors that would contribute to the benefit side of a benefit/cost ratio. Based on the five analyses, it seems reasonable to conclude that the value of the product of the CCC makes a substantial contribution to program benefits. This contribution appears to be so substantial, in fact, that if one were to consider other program benefits to corpsmembers and society, as well as any additional costs not already captured in CCC and work sponsor costs, it is likely that total benefits would equal or exceed total costs. This is because the five analyses suggest that the benefits from work alone are sufficient to offset CCC operating costs.

It should be noted that these findings are controversial for two reasons. First, none of the analyses is of the methodological or theoretical quality from which P/PV would ordinarily draw firm conclusions. The work value research is a small part of a much larger evaluation of the CCC that P/PV is conducting. Resources available for the work value review were quite limited. To maxi-

mize these resources, we used secondary data as much as possible. Because these data had already been collected and, in two cases, analyzed, it was not possible to ensure adequate levels of response and other quality control measures. In addition, the willingness-to-pay survey, in which P/PV did carry out data collection, is a small experimental survey whose limitations were noted earlier. While the approach chosen to look at work value broadened the number of analyses that could be reviewed, it also severely restricted the ability of the researchers to compensate for the kinds of difficulties and limitations discussed throughout this report.

The second area of controversy has to do with the findings themselves. Even given their limitations, all but one find value from work equal to or in excess of CCC costs. By contrast, other respected valuation studies of employment and training programs -- Supported Work, Ventures in Community Improvement (VICI) and the Job Corps -- have found the value of work to be less than the operating costs of the program. The Supported Work and Job Corps valuations, both done by Mathematica, Inc., found value-to-cost ratios of .66 and .27 respectively. P/PV estimated that the work produced by the VICI demonstration created a value/cost ratio of .47.

Supported Work, the Job Corps and VICI programs -- like the CCC -- do some productive work while benefiting participants, but they do so to varying degrees and none of these programs is directly comparable to the CCC. The major focus of the Job Corps is youth development, though some work is accomplished. Thus, one would expect the ratio of work output to program costs to be lower than for the CCC. The Supported Work program is more like the CCC in that work output is a central feature. However, in VICI, employability development is of utmost importance and work is a vehicle for gaining experience and basic work skills. It is possible that training at the job site lowers production and that this accounts for differences in the value/cost ratios between VICI and the CCC.

However, another explanation should also be considered. Valuations of Supported Work, VICI and the Job Corps were based on the alternative supplier price methodology. Each took a sample of work projects, identified an appropriate alternative supplier, and used outside estimators to determine what price the alternative supplier would charge to accomplish the same end product. All the studies reported value-in-exchange as a result of these calculations.

Of the five analyses of the value of CCC work reported earlier, only one used a methodology that is even roughly comparable to that used in the three studies just mentioned. This analysis -- the third of the five -- asked work sponsors to estimate what an alternative supplier would have charged to accomplish the same

end product as the CCC. This analysis finds a value/cost ratio of .60 -- a finding that seems reasonable given the similarities between the CCC and Supported Work, and the differences among these two programs, VICI and the Job Corps.

However, this report stresses that alternative supplier price approaches may underestimate the value of the work to society. While this approach is fairly practical to use, it can easily result in estimates lower than those based on quasi-economic or environmental economics techniques. This is because suppliers generally base their estimates on the complexity of the tasks to be accomplished, not the long-term value of the end product. Most of the work done by the CCC and other programs that serve youthful participants is unskilled. It may be that alternative supplier methods assign value based more on how much and how difficult the work is, rather than on the value of the finished product. If this is true, it would help to explain why CCC work is valued about the same as Supported Work and somewhat higher than VICI output, and why all three programs are more highly valued than the Job Corps.

Alternative supplier price approaches answer the question "What would it have cost the work sponsor to produce this work if some organization other than the corps had done it?" Dollar values produced by these methods are measures of relative efficiency rather than value. If one is willing to assume that the work was worth doing, and that the cost of doing it reflects its value, then one can treat alternative supplier prices as a valuation tool. In employing these assumptions, however, one opens oneself up to questions about their validity. The method does not establish whether or not the work needed doing or would have been done in the absence of the corps; nor does it establish the relationship between price or cost and value.

These questions may be largely academic. When describing the volume of work they do, for example, corps can use alternative supplier price methods to describe how much work was accomplished for work sponsors.

When corps are in the position of having to justify their expenditures, when they are being closely scrutinized or preparing a benefit/cost analysis, traditional alternative supplier price methods for valuing work are less defensible. In these cases, the question to be answered is not "What would it have cost the work sponsor to do this work?" but, "What value does society place on the products of the corps?" For the CCC, the specific question might be phrased, "What is the aggregate value of citizens' willingness to pay for the environmental protection and improvements and the recreational enhancements created by the CCC?"

While the answers to the last two questions might be the same as those answered by alternative supplier price approaches (as one would expect for goods exchanged in a freely operating market), there is no theoretical reason why the answers would necessarily be the same for the kinds of goods and services produced by the CCC. In fact, as was pointed out earlier, there are many reasons to expect different answers. If corps were doing substantial "make-work" projects or were using labor inefficiently, the actual value of the work would be lower than alternative supplier prices would indicate. If, on the other hand, consumer surplus was high, other externalities existed, a product was inexpensive to produce at the margin but each additional unit increased the long-lasting benefit, etc., then one would expect alternative prices to underestimate value-to-society.

One thing that distinguishes youth service and conservation corps from other employment and training programs is their central emphasis on the production of non-market goods and services. Exactly because of the kinds of projects in which corps engage, traditional valuation methods may not fully capture the dollar value of the work.

RECOMMENDATIONS FOR THE CCC

No simple, inexpensive method of valuing conservation corps work emerges from this research. As was noted earlier, the CCC needs work value information routinely to describe the kinds and volume of work it does; less frequently, to conduct a more sophisticated, precise accounting of the value of its work. No one method will answer both these needs. Our suggestions for meeting each are noted below:

Routine Data Collection

- As part of its work projects data base, the CCC should further refine its recording of productive work and description of the work in quantified form. To accomplish this, the CCC must track the products of its crews in addition to the hours expended for various kinds of work.

- This requires a standardized typology of work projects, along with a standard unit of measurement for each. To expand existing capacity in this regard, the CCC should review its list of project codes and develop additional product-related units of measurement (e.g., miles of trail cleared, acres of trees planted, square feet of buildings constructed, acres of forest saved during fire emergencies). The goal is to develop units that can be valued as products, rather than labor.

- The CCC can improve the quality of these data by training project staff in the use of the codes and units of measurement; requiring that the actual end product of the work be recorded, not just estimated at the beginning of the project; and periodically inspecting projects to check the accuracy of the data. In addition, projects that do not fall into existing categories should be described in detail. New codes and units of measurement should always be assigned statewide.

- As needed, the CCC can aggregate this information to provide:

  - complete descriptions of the products of CCC work crews, and

  - descriptions of the magnitude of work accomplished, using the product-related units of measure.

- As part of its routine data base, project staff should also collect, from a sample of work sponsors, information to be used for the more precise analyses. This information should include:

  - an estimate of the sponsors' actual expenditures to complete the project, excluding any amount paid to the CCC;

  - an estimate of who would have been the most likely alternative supplier of the product (e.g.,its own staff, a private contractor, some other agency, no one, etc.);

  - an estimate of the value of the work in subjective terms (high, medium, low) -- not based on the product but on their need for it; that is, an estimate of value unbiased by the quality of the finished product.

Special Data Collection and Analysis

- We advise the CCC not to do studies that fall in the middle ground between approximations based on routine and on special data collection. Middle ground studies (those that analyze poor quality data) are neither defensible nor necessarily inexpensive.

- We recommend special studies that use outside appraisers to value a sample of CCC work projects, or those that incorporate willingness-to-pay questions into random surveys of state citizens. The former are based on an alternative supplier methodology, the latter on the techniques of environmental economics.

- Outside appraisers can determine the price to accomplish the same end result for a sample of work projects. From this information, the CCC can develop estimates of what another real or hypothetical supplier would charge to do all of the work done by the CCC in a given time period.

- The conceptual shortcomings of the alternative supplier approach -- that it equates value with market price -- are inherent and should be recognized if this approach is chosen. Many of the methodological shortcomings can be avoided if the routine data described earlier are of good quality, if good outside appraisers are used to set values, if the CCC selects a truly representative sample of work projects to value, and so on.

- While the willingness-to-pay survey is more conceptually appealing, it has its own set of methodological demands. Questionnaire items must be written and tested to ensure that they isolate the work done by the CCC from that of other agencies and put the work in perspective. Given the number of recreational facilities and environmental projects in the state, the marginal contribution of the CCC is difficult to convey. Another concern is sampling. One criticism of the limited study P/PV carried out was that it did not have the resources to survey a random sample of the California population. Thus, generalizing required certain assumptions that seriously weakened our confidence in the results.

- If the CCC does a willingness-to-pay study, it can look for a state survey to which questions could be attached. This kind of study, called an omnibus survey, allows various sponsors to share the cost of sampling and data collection. For example, the CCC could participate in one of the household recreation surveys regularly carried out in California. If the CCC can "piggy-back" onto a random sample survey, it can spend its resources on developing good questions and on

analysis, rather than on very expensive sample design and data collection.

- Finally, whatever routine or special studies the CCC does to value its work, it should consider developing a range of numbers, based on more than one approach. Until the state of the art in work valuation advances, this will be the most conservative and, hence, most defensible approach.

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TECHNICAL APPENDIX

A. Introduction

The main innovation in this work value study is the use of one of the techniques of environmental economics to p`ace a dollar value on work done by the CCC. Because these have not been used before to evaluate the work of any corps, and because results look different from more typical work value measures, it is important to provide the reader with sufficient information to judge the approach independently. In addition, because these concepts, methods, and analyses may be applied more frequently in the future, it is important to share the experience and methodological issues that arise in applying them.

From the start, it is probably helpful to identify precisely what this method is, and what it is not. The study is neither an auditor's investigation nor an ecological study of the CCC. The differences among accounting, ecological and economic perspectives can be summarized as follows:

1. Accounting perspective. Such a study would investigate the expenditures of the CCC work program, making sure that there was no fraud, abuse or gross overpayment for tools and equipment. Such a study, as done by the U.S. General Accounting Office, for example, might also include an examination of whether the CCC was conducting the types of work projects described by law, and whether the CCC was an efficient mechanism for conducting the work when compared with potential alternative suppliers.

2. Ecological perspective. A study from this point of view would examine the impact of the CCC on wildlife populations (number of salmon, for example), air quality, acres of land lost to fires or floods, long-term ecological effects of those fire and flood losses, and changes in the conservation-related attitudes and practices of citizens in California as a result of the CCC's activities.

3. Economic perspective. Such a study would examine whether or not the value of the CCC's work program to citizens in the state outweighs its costs. Value, from this perspective, is measured in terms of the willingness and ability of California residents to pay for the CCC's work.

Each of these studies has its uses. The economic perspective was chosen here to put a dollar value on the CCC's work. In a sense this perspective builds on the other two. The economic analysis assumes that the program is reasonably efficient and not plagued by fraud or abuse. It also assumes sufficient knowledge about the ecological impact of the program so that its products can be described clearly and accurately.

It is difficult to determine the economic value of CCC work for two reasons. First, it is conducted on public land and waters for which no user fees are charged. If user fees were charged, there would be a market transaction which could serve as a proxy for value. Since these goods and services are not transacted directly on the market, some means other than actual market price must be found in order to assign value.

Second, even where a proxy market price could be assigned, market price measures only a subset of value to society. This is be cause market price captures value-in-exchange (at the margin), but not consumer surplus (the amount above the price by which non-marginal consumers value the product). For goods and services for which there are few substitutes (clear streams, improved forests, natural recreation facilities), consumer surplus may be quite high.

Attempts made by youth conservation corps to estimate the value of their work have relied primarily on alternative supplier prices, or methods that are based on value-in-exchange. A different method for estimating work value can be built around principles developed in public finance and its subdiscipline of environmental economics.

The next section of this appendix provides more background on environmental economics. Following that is a description of the study methodology. Following that is a section that describes the analysis and its results in fuller detail than does the summary provided in the body of this report.

B. Background Information on Environmental Economics

Some Principles in Public Finance

In economics, the market value of a good or service depends on the intersection of supply and demand. When all externalities -- in both production and consumption -- are internalized, the market price of the good or service will result in production of the socially optimal amount. In such instances the demand curve is actually the social-benefit curve, and the supply curve is the social-cost curve. Production of the good or service will continue until the marginal cost of production exceeds the marginal benefit to society.

Even in such instances, however, the market price of the good does not necessarily reflect its average benefit to society. Depending on the elasticity of demand and the quantity demanded, different goods will produce different amounts of consumer surplus. Consumer surplus refers to the fact that individuals are almost always willing to pay more for a good or service than the market price. Goods which are necessities (like water) or for which there are few substitutes (like a scenic river) have inelastic demand curves and produce a lot of consumer surplus. Such goods may provide much benefit to society, even though their market price is quite low, or even zero. Putting this in another way, economists distinguish between value-in-exchange and value in-use. Value-in-exchange is the market price of the good. Value-in-use is the area under the demand curve -- the sum of both value-in-exchange and consumer surplus -- and, thus, the total willingness of society to pay for a good or service. A correct valuation of a good's total benefit to society requires looking at its value-in-use.

Complicating attempts to place values on goods and services is the fact that many services are of benefit to society but are never transacted in any market. Public goods are of this type and they primarily display two characteristics: 1) people can not be excluded from using them once they are produced; and 2) the marginal cost of providing them to an extra user is zero. There are many examples of public goods -- national defense, police and fire protection, national parks, highways, traffic lights, television waves. Taking national defense as an example, once the civil air patrol is in the sky, there is no way to exclude anyone from benefiting from its protection. Moreover, there is no marginal cost to protect an additional person.

Further complicating all of this is the fact that goods differ in the degree of their "public-ness." It is impossible to exclude someone from national defense; difficult, but not impossible, to exclude someone from a national park; and fairly easy to exclude someone from a highway (by using toll booths). While the marginal cost for additional users of national defense is zero at all levels, the marginal cost for additional users of roads and national parks is zero at low levels of use; but at higher levels of use, congestion costs set in.

Most public goods are provided by government -- at the local, state or federal level. There is a free-rider problem in economics which refers to the fact that because people know a service is going to be produced whether they pay for it or not, they tend to offer to pay nothing or much less than the service is actually worth to them. Actually, of course, people pay for public goods produced by the government through taxes. By voting, citizens get a chance to choose between different packages of public goods. People also can "vote with their feet" in moving to communities with a package of public goods that is most

satisfactory to them or away from communities where public goods are not satisfactory.

Some Concepts In Environmental Economics

Over the past twenty years, environmental economics has developed as a sub-field of public finance. For the most part, environmental economics is concerned with the valuation of natural resources and with other issues relating to preservation or development of natural resources. In recent years, environmental economists have entered the controversies surrounding the Alaskan Pipeline, Hell's Canyon, Mineral King Valley, the leasing of off shore oil exploration rights, and the leasing of mineral rights in or near national forests and parks. A whole environmental economics literature has developed for estimating the value of non-market goods such as national parks and wildlife areas. Environmental economics centers around the principles of market value and value-in-use, availability of substitutes, congestion costs, complementary goods, public or private goods, final or intermediate goods, proper discounting of future benefits to both preservation and development, and the notion of irreversibility.

Environmental economists have developed a number of techniques to estimate the value of non-market goods. One technique uses travel costs in a natural experiment that relates visitor rates at a resource to the distance traveled and the cost of getting to it.

In evaluating choices between preservation and development of Mineral King Valley, for instance, economists asked visitors how far they traveled to the recreation site; by setting up various travel zones, they were able to derive a demand curve for the site to estimate its value-in-use (Stanley, 1974).

Another technique used by environmental economists to value a non-market good surveys users about their willingness-to-pay for the good. In most cases, rather than ask about willingness-to-pay directly, economists derive it indirectly either by framing the question in a referendum format or by asking individuals whether they would continue to consume a good or service at progressively higher price levels. In special circumstances, economists have actually been able to conduct a natural experiment to determine willingness of consumers to pay for public goods. For example, a study in Wisconsin took advantage of the fact that hunters were required to apply by mail for a free permit to hunt Canadian geese in a special region of the state. A sample of hunters was sent checks ranging from $1 to $200 along with their duck permits. The hunters were given the option of either keeping the check or keeping the permit, and thus it was possible to determine the willingness of sportsmen to pay for the right to hunt Canadian geese in the special region (Bishop and Heberlein, 1979).

A third technique used by economists to measure the value of non-market goods involves the use of hedonic price indexes. An hedonic price index attempts to place values on the various characteristics of a good, rather than the good itself. In one of its first uses, for example, an hedonic index was developed for characteristics of automobiles. By putting the properties (size of engine, size of wheelbase, four-door or two-door, safety features) of various models into a regression equation with price as the dependent variable, hedonic prices were derived for each property even though the property itself was never transacted on the market. (See Freeman, 1979, for a discussion of the hedonic price approach).

In placing values on a recreation area, environmental economists have noted that a site's value depends not only on benefits to actual users, but also on the extent to which it relieves congestion in alternative recreation sites. Economists looking at congestion and optimal use of the Spanish Peaks recreation area surveyed users for their willingness-to-pay at alternative levels of congestion (Chiccheti and Smith, 1973). Economists studying congestion at swimming beaches in Maine surveyed users for willingness-to-pay over a 30-day period and related these responses to different levels of congestion during the days surveyed (McConnell, 1977).

While no study in environmental economics has thus far examined the value of work in a program such as the CCC, it is clear that a number of environmental economics research efforts closely relate to the type of work that youth conservation corps do. Studies of the value of trails at various levels of congestion relate broadly, though not directly, to the CCC's trail maintenance work. Studies of willingness to pay for beach use could, with a little adaption, be brought to bear on some of the CCC's park development work. Studies of the existence value of wild life clearly have some relation to any potential effort to estimate the value of the CCC's work restoring salmon and improving wildlife habitats.

It is important to stress that environmental economics is not an exact science. Each of the approaches to estimating the demand for non-market goods (with the exception of natural experiments) has either methodological or theoretical problems. In travel cost models, it is often difficult to specify fully the alternative recreation sites available. Survey methods face the theoretical problems that people do not always behave as they say they will and that individuals may give more positive (strategic) responses to survey questions when their own money is not on the line. In hedonic price approaches, it is not always easy to capture all relevant variables that should be controlled for in a model.

Still, the appealing feature about environmental economics is that it recognizes value-in-use as well as market value. Moreover, there is a continuing body of research in environmental economics which helps identify problems and possible biases in the various techniques the discipline uses. There are, for example, some excellent empirical studies on strategic bias in survey approaches and on comparing the results of survey and travel cost approaches with the results of actual experiments. (See Bohm, 1972; and Bishop and Heberlein, 1979. For a good overview of environmental economics and its applications, see Krutilla and Fisher, 1975; and Freeman, 1979.)

The economic analysis described in this appendix is based on surveys of California residents about their willingness to pay to support the CCC's work activities. This survey required a description of CCC work projects sufficient for respondents to understand the role the CCC plays in state-wide environmental activities. To prepare this description, P/PV interviewed staff at other natural resources agencies, visited CCC work sites, spoke to CCC staff and work sponsors, and reviewed program records and reports. A limited ecological study was done in order to prepare accurate descriptions of CCC work.

Even so, these descriptions do not provide a perfect understanding of the CCC's role. Most of what the CCC does enhances existing facilities rather than develops new resources. Often the CCC is not the sole contributor to a facility -- CCC work crews assist firefighters, general labor crews, construction workers and others from natural resources agencies to accomplish wide goals of reforestation, park development, emergency response and so on. Thus, it can be difficult to identify exactly the CCC's contribution to the California environment.

However, two points should be made in this regard. First, a complete understanding of the CCC's ecological impact in California can never be attained. There are too many other factors -- including the work of other natural resource agencies -- to permit a complete segregation of the CCC's marginal effect on salmon, birds, deer, clean air and the conservation ethic of state residents.

Second, human beings make judgments about the value of goods and services every day without the benefit of perfect information. People are willing to pay a certain amount for a new car without knowing precisely how much they will use the car over the next five years, how long it will last, or how safe it is relative to other models. People are willing to pay a certain amount for a new house without knowing exactly what the new neighbors will be like or what kind of friends their children will meet in the new school. Citizens are willing to pay a certain amount for local police protection without knowing what the chances are of ever needing it or what its effect is on crime prevention.

To be sure, the better the understanding that California residents have of the CCC's marginal contribution to the state's environment, the more informed will be their estimates of the value of the CCC's work. But any succinct or easily obtained description will fall short of a clear delineation of the CCC's marginal contribution.

C. Methodology

A valuation of CCC work built around the principles of environmental economics can focus on the willingness and ability of consumers to pay for the CCC's work projects. Such an analysis does not attempt to estimate the specific effects of the CCC on wildlife, forests and the general ecology of California (although the better one understands the effects of the CCC, the better one can frame questions to survey the general public about its value). Nor does it ask consumers or the general public to estimate precisely the value of the CCC's work to the environment (although the better individuals understand the effects of the CCC, the more informed their responses will be). Rather, the analysis attempts to estimate the willingness of California citizens to pay to support the work of the CCC. As discussed in the report, society's willingness to pay for a good or service reflects the value it places on the good or service.

This analysis does not assume perfect knowledge of the value of the CCC's work to the environment. Neither does it assume know ledge of why citizens support these programs. Rather, the analysis starts from the premises that Californians may value -- whether out of altruism or enlightened self-interest -- the type of conservation work that the CCC does, and that it is possible to make at least a rough estimate of the extent of that value.

A variety of research methodologies for studying the CCC would be compatible with the principles of environmental economics. One possible approach would take a random sample of CCC projects and estimate the value of the work to users, perhaps by using a travel-cost technique. A problem here is that the majority of the CCC's work consists of enhancing an existing park, stream, trail, or forest, not developing a new resource. Travel-cost measures are more applicable to estimating the value of a given resource -- such as a scenic river or park -- than enhancements to that resource. Another problem with a project-by-project analysis of the CCC is that the CCC works on nearly 2000 projects a year, making it difficult to interview sufficient numbers of users at individual sites to yield statistically reliable results. A further problem is that individual projects may not be the appropriate unit of analysis for studying the CCC's efforts -- that users of outdoor resources visit several parks, streams and trails over the course of a year and that they think in terms of broad categories, such as clean streams and well-maintained

parks, rather than in terms of individual streams and parks.

An alternative approach to evaluating the CCC's work program would be to interview a random sample of California citizens about their willingness to pay for various categories of CCC projects. This method has much appeal for many CCC work activities, such as reforestation and forest fire control, because citizens of the state in general, rather than particular user groups, appear to be the beneficiaries. Moreover, providing respondents with the whole array of CCC activities is more conceptually correct than a project-by-project or category-by-category presentation, because there is no doubt a great deal of overlap among the beneficiaries of various CCC projects and activities. Assessing the whole array permits users to set priorities and take into account their overall willingness to pay to support the CCC.

Surveying a random sample of the California population would have been too costly for this study. The role of the CCC in various conservation activities in the state is complicated to explain. In most of its projects, the CCC is not the sole provider of conservation work. Rather, it is usually one of several agencies in the state involved in such activities as trail maintenance, forest fire control and reforestation. Describing the CCC's role in these activities would require a lengthy questionnaire. Techniques that could convey this information to respondents -- a long telephone interview, a combined mail and telephone interview, in-person interviews -- and representative sampling were considerably beyond the financial resources available.

Between 1978 and 1980, the State of California carried out an extensive study of recreation in the state. A random sample of the state population was interviewed, and from this sample it is possible to estimate the total number of state residents participating in various outdoor recreation activities. One of the recreation activities in which a large proportion (16.7 percent) of California residents participated was hiking and backpacking. Because these data were available, it was possible to ask a small number of hikers and backpackers about their willingness to pay to support various work activities of the CCC, and then to generalize these responses to all hikers and backpackers in the state.

Besides this general survey of hikers and backpackers, the research design includes a survey of salmon and steelhead trout fishermen about their willingness to pay for the CCC's work related to salmon restoration. This analysis complements the more general survey of hikers and backpackers. Salmon restoration was selected for study because it is clear who the direct beneficiaries of this work effort are. While they include sport fishermen, Indian gill-netting fishermen and commercial salmon fishermen, we restricted our survey to sport fishermen. According to the 1980 National Survey of Fishing, Hunting and Wildlife

Associated Recreation conducted by the U.S. Bureau of the Census and the U.S. Fish and Wildlife Service, an estimated 240,800 California residents participate in salmon and trout fishing in the state.

The demand for CCC work was estimated from the willingness-to-pay of these survey respondents. This involved three analytic steps: first, willingness-to-pay was calculated just for those surveyed. Then, these responses were generalized to the whole population of California residents who hike, backpack or fish, based on the numbers of such people reported in state surveys. Finally, it was assumed that the demand for CCC goods and services among all other California residents was zero. In effect, this means that the state-wide demand is based only on the demand of the 17 percent of California residents who participate in hiking, backpacking and fishing. This approach gambles that the responses of hikers and backpackers -- generalized to the population of hikers in the state -- reflect in part the demand for the CCC's work in California. On the one hand, it was possible that there would be sufficient willingness to pay among hikers and backpackers alone to demonstrate justification for the CCC program. On the other hand, if willingness to pay among hikers and backpackers was especially low, then this would suggest minimal value placed on the CCC's work by the general public.

Questionnaire

The questionnaire given to hikers and backpackers was set up in a referendum format. Eight work activities of the CCC were described in detail, and respondents were asked how they would vote on a state referendum either to discontinue the activity or to pay for it out of an increase in user fees that would cost the respondent a given amount of money. A ninth question on the survey attempted to determine altruistic support for the program because of its benefits to youth participants. Five versions of the questionnaire -- stipulating from $1 to $20 for each activity -- were distributed randomly to individuals interviewed.

The survey of salmon fishermen was shorter -- only one page. Again respondents were presented with a referendum situation. The survey described the CCC's salmon restoration work and gave fishermen the opportunity to say whether they would vote to discontinue the CCC's salmon restoration efforts or to pay for it out of an increase in the fee for a state fishing license at a given amount. Five versions of the survey were distributed, with the increase in the fee ranging from $.50 to $10.

One serious problem concerns describing CCC activities accurately: it is impossible to know whether respondents really understood the CCC's role in environmental activities. For example, in describing the CCC's forest and wildland fire control work, the questionnaire stated that "the CCC is one of a number of

agencies. . . The CCC supplements the 35 youth offender and inmate fire centers in the state with two CCC front line fire centers and nine other CCC centers in the state. . ." The questionnaire did not state the exact proportion of fire control work in the state that is done by CCC corpsmembers, in terms of hours, fires controlled or some other measure. It may be that respondents answered in terms of their opinion of the activity itself, not the quantity of that activity that the CCC contributes. Simply put, we are concerned that respondents may be placing value on trees, not the relatively small incremental work done by the CCC to preserve or plant new trees.

Wording of the questionnaire is another concern. Although considerable effort was spent to describe the eight work activities of the CCC being valued, in retrospect the descriptions may have been biased in ways favorable to the activities. For example, question 3 describing park development said, "This past year, the CCC worked with over 80 local and regional parks on individual projects. . . ." If the word "over" is changed to "only," or simply omitted, the sentence changes tone. An attempt was made to be evenhanded in the descriptions; however, such subtle wording issues can bias responses.

It is very difficult to safeguard against these types of bias. To understand exactly what youth corps do, the respondent needs to know something about conservation work in general, as well as the contribution of specific activities (hand cultivation of trees, for example) to some visible product (healthy forests). In addition, respondents need precise understanding of the work of a program such as the CCC in order to distinguish the role the CCC plays relative to other agencies. Are those additional hours that the CCC provides in fighting forest fires essential, or merely helpful, in putting out the fires? In some cases, the answers to these questions are not known. Where they are known, they are complicated to convey.

If this analysis were to be replicated, one would want to take even more care when delineating the products of the CCC. As it is, we have tried to account for potential bias in the analysis by cautioning readers that the respondents were likely to be highly favorable to the CCC because of who they were and where they were found, because of the way descriptions were worded, and because they may not have understood exactly what they were being asked to value. All of these would tend to inflate willingness-to-pay.

Data collection

The survey was administered to hikers and backpackers in the state of California in Fall 1984. The interviews took place on a popular trail in Yosemite National Park, at Mount Tamalpais State Park near San Francisco, and in a national forest in the Angeles

Mountains outside Los Angeles. Each of these locations provided a mix of serious and less serious hikers. .

The questionnaires were given out in parking lots or at trail heads, and respondents were asked to fill out the survey on the spot. About 20 percent of the individuals approached refused to fill out the survey -- in most cases because they were in a hurry or thought the questionnaire was too long. A few people who refused indicated they did not want to be disturbed, and a few were simply leery about being approached for anything. Another 10 percent of individuals indicated a strong preference for taking the surveys home and mailing them back. While about 25 surveys were given out in this manner, only a few people returned them -- and while the responses were favorable to the CCC, they were not included in the results because of potential bias.

The question most asked by respondents was whether their responses to the nine questions were additive; that is, whether there was a common cost constraint. They were told that, as indicated on the survey, the responses were additive. Some respondents had problems with user fees being the method of revenue collection. They were told that they should not answer "no" simply because of the method of collection -- that they could assume that the money would come out of general taxes, as long as they were still willing to pay the given amount. Some respondents expressed reservations that only hikers and back-packers were being asked to pay for work activities that benefited the general public. They were told that the questionnaire was not proposing that only hikers and backpackers pay for the services -- that it was only examining how willing hikers and backpackers would be to pay to support the CCC's work, assuming that the general public would also pay.

The survey regarding salmon restoration was administered to 151 sport fishermen. Most of the surveys were administered along the Klamuth and Eel Rivers in Northern California, although a few surveys were given on the Sacramento River. The sample included both boat and shore fishermen. On the Klamuth River, the survey was conducted at five different sites, all clustered around the towns of Klamuth and Klamuth Glen. Interviews were also held at less popular sites on the Eel and Sacramento Rivers.

About 10 percent of the fishermen who were approached refused to fill out the survey. Most of these refusals stemmed from bitter ness about the state's permitting Indians to use special gill nets to catch fish -- even though that issue is completely independent of the CCC's salmon restoration work. Also, even among fishermen who filled out the survey, a fair number voted against any increase in the fishing license fee because of opposition to gill netting, and used the survey as an opportunity to vent their frustrations.

To summarize, about 250 hikers and backpackers and 170 salmon

fishermen were approached. Questionnaires from 212 hikers and backpackers were completed and used in the analysis, as were 151 from salmon fishermen. There is no claim that the sample is representative of citizens of California, nor even of users of California parks and waters. In fact, it is likely -- because of the response rate, the method that was used to collect data, and the seriousness with which those who did complete the questionnaire pondered their answers -- that the sample represents the most interested users and, thus, those most likely to be favorably disposed towards the CCC. When making projections from their responses, then, it has to be assumed that they represent a high estimate of willingness to pay for the CCC.

The point to remember, however, is that one is interested in the willingness-to-pay of California citizens in the aggregate. If it is assumed that all other groups (general citizens, less interested park and water users) have zero willingness to pay for the CCC, then the aggregate willingness of the people surveyed represents a conservative aggregate value for the state as a whole, based on relatively high individual responses. Put another way, this method relies on the value of the CCC to a special interest group and it may be that this group alone is willing to pay more for the goods and services of the CCC than they cost.

D. Results

Sample characteristics -- Hikers and Backpackers Survey

Table 5 compares the characteristics of the respondents in the willingness-to-pay survey with the characteristics of users of hiking and backpacking user-days in California in 1978-80. These data are not directly comparable. From the state survey, it is possible to determine that females account for 48 percent of user-days, but not that 48 percent of hikers and backpackers are female. Because of the way user days are calculated, any individual may be counted more than once. Thus, it is impossible to tell whether the state figures represent the characteristics of a small but avid group (each of whom accounts for many user-days) or the characteristics of many different individuals.

Table 5

CHARACTERISTICS OF INDIVIDUALS IN TRAIL SURVEY AS COMPARED TO USERS OF HIKER AND BACKPACKER USER-DAYS IN THE 1978-1980 STATE RECREATION SURVEY

	P/PV Survey n=(212)	State Survey n=(2.78 million)
Female	38%	48%
Times hiking per year	13	16
Income		
$ 6,999 or less	07	11
$ 7,000 to $14,999	13	18
$15,000 to $24,999	22	18
$25,000 to $34,999	23	16
$35,000 and up	36	37
Age		
18-24	12	23
25-34	45	26
35-44	21	26
45-54	08	11
55-64	07	09
65 and over	02	06

The characteristics of the hikers and backpackers who completed the willingness-to-pay survey resemble those who account for hiking and backpacking user-days in California. Males are over-represented in the willingness-to-pay survey, as are individuals between the ages of 25 and 34. The average number of times hiking per year is slightly lower -- 13, compared to 16 for the state survey. Even so, one could characterize the willingness-to-pay respondents as frequent hikers; they hike or backpack about once a month on the average. In terms of household income, the individuals in the willingness-to-pay survey are very similar to the people who account for user-days.

Analysis -- Hikers Survey

Table 6 displays respondents' answers to referendum questions at each price level. As the table shows, there is evidence of a

great deal of support for CCC activities at all price levels. Nearly all respondents were willing to support the CCC at the highest price levels in every category. In general, as one would expect, willingness-to-pay is greater at lower price levels and drops off as price increases. This relationship is not perfectly smooth, however. In five of the eight categories, more respondents were willing to pay $10 than were willing to pay $5 to support CCC work, although these inversions are not great. One explanation rests with the small sample size. With a large enough sample, one would expect the results to be smoother. One would have more confidence in the results if willingness-to-pay consistently declined as price levels increased.

Table 6

PROPORTION RESPONDING YES TO

REFERENDUM ISSUES, BY WORK ACTIVITY

AND BY AMOUNT OF MONEY SPECIFIED

	Trail Work	Forest Work	Park Work	Fire Control
$ 1	100%	95%	93%	97%
$ 2	90	90	85	90
$ 5	90	83	73	78
$10	94	89	74	77
$20	79	65	56	70

	Wildlife/ Erosion	Construction Work	Salmon Restoration	Emergency Work
$ 1	95%	80%	85%	98%
$ 2	93	71	83	83
$ 5	76	68	71	76
$10	87	68	78	71
$20	79	53	65	58

Table 7 presents the results of logit models run for each work category. These models estimate the probability of a positive response by individuals to each referendum question based on the background characteristics of the individuals and the price that was quoted to them on the survey form. The observed dependent variable in each case is the positive or negative vote of the respondent. The explanatory variables are the amount specified to be paid on the survey form, the income level of respondent, the age, sex and times hiking per year of the respondent, and the

location where the interview took place. These latter four variables are intended to account for differences in tastes of individuals by age, sex, number of times they go hiking and where they hike.

Table 7

LOGIT RESULTS PREDICTING YES/NO

RESPONSES TO REFERENDUM QUESTIONS

	Trail Work	Forest Work	Park Work	Fire Control
Constant	.18	1.56	.31	2.31
Price	-.07*	-.10*	-.11*	-.08*
Female	.44	.76	-.04	.10
Times hiking	.04	.00	.02	.04
Yosemite	1.06	.11	1.29	-.95
Mt.Tamalpais	1.06	-.77	-.11	-1.39
Income	.01	-.00	.04	-.00
Age	.03	.03	.00	.02
Chi-squared	11.78	17.55*	29.54*	13.44
Sample size	188	186	188	188

	Wildlife/ Erosion	Construction Work	Salmon Restoration	Emergency Work
Constant	1.43	-.41	1.14	-.55
Price	-.05	-.06*	-.05*	-.09*
Female	.23	-.40	-.63	-.04
Time hiking	.00	.02	.02	.01
Yosemite	.12	.32	-.50	1.29
Mt.Tamalpais	-.51	-.51	-1.16	.55
Income	-.01	.01	.00	-.00
Age	.04	.04	.03	.05
Chi-squared	7.27	20.02*	15.81*	22.55*
Sample size	188	188	188	188

*Indicates Statistically Significant at the .05 level.

Note: Of the original sample of 212, 26 observations were deleted in the logit analysis due to missing data points. From the logit results in Table 3, it is possible to derive an estimate of the willingness of hikers and backpackers in the sample to pay to support the work activities of the CCC.

Table 8 presents the highest price at which the average person in the sample would always vote yes to fund each of the CCC's work categories. That is, the prices in the table are those at which the probability of voting yes or no is .50, based on a logit model. The model used mean values for demographic characteristics to simulate the willingness-to-pay of the average respondent. Table 8 also presents the estimated benefit to society of the CCC's work program when the results from the sample are generalized to the population of hikers and backpackers in California.

Table 8

ESTIMATED BENEFIT TO SOCIETY

OF THE CCC'S WORK PROGRAM, BY CATEGORY

	Average Hiker	Population of Hikers
Trail Maintenance	$ 18	$ 50M
Forest Improvement	13	36M
Park Development	15	41M
Forest Fire Control	11	31M
Construction Work	10	28M
Wildlife/Erosion	17	47M
Salmon Restoration	13	36M
Emergency Response	12	34M
Total	$109	$303M

The estimates in Table 8 are for the average individual in the trail sample. These estimates do not vary much by sex, age, income or the site where the interviews took place. For example, the average person in the sample was willing to pay $17.85 to support the CCC's trail work. This varied from $17.53 for males to $18.24 for females, and from $16.47 for lower income individuals to $18.04 for higher income individuals. Average willing ness to pay to support trail work varied from $15.19 in Los Angeles to $17.99 in interviews near San Francisco. However, in other work categories, individuals interviewed near Los Angeles were willing to pay more than individuals interviewed in Yosemite or near San Francisco.

Sample characteristics -- Fishing Survey

The fishing survey varied somewhat from the survey of hikers and backpackers. While the trail survey was more general, the fish ing survey addressed one specific CCC work activity with a questionnaire aimed at direct beneficiaries of the CCC effort. In addition, the payment mechanism in the fishing survey -- an in crease in the state fishing license fee -- was much more direct

and specific than the payment mechanism described in the trail survey.

The sample was heavily weighted towards frequent fishermen. The average times fishing was 38, or about three times a month. The sample did contain a cross-section of ages and types of fishing. About half the sample were between ages 35 and 64; a quarter were younger and a quarter older. About half fished from boats and half from shore. The sample contained few females -- only 14 percent -- and included many people with low or moderate incomes. Thirty percent reported incomes lower than $15,000 annually; sixty-five percent had incomes below $25,000. Unfortunately, no data were available with which to make comparisons with the actual fishermen to whom willingness-to-pay was generalized.

Table 9

CHARACTERISTICS OF INDIVIDUALS

IN THE FISHING SURVEY

	Percent
Female	14%
Age	
34 or less	28
35 to 64	48
65 and above	24
Income	
$14,999 or less	30
$15,000 to $24,999	35
$25,000 to $34,999	16
$35,000 and up	19
Times Fishing Per Year	38
Years Fishing	31
Fishing from Boat	57
Fishing from Shore	43
Klamuth River	72
Eel River	23
Sacramento River	05
Sample Size	151

Analysis -- Fishing Survey

Table 10 lists the percentage responding positively to continuing the CCC's salmon restoration work at various increases in the fishing license fee. Price does make a difference in the willingness of salmon fishermen to vote "yes" to continue the CCC's salmon restoration work: 87 percent of fishermen given the 50 cent referendum form voted "yes," as opposed to 67 percent of fishermen given the $10 referendum form. As in the trail survey, the relationship between price and willingness to pay is not perfectly smooth. Again, however, this could be explained by the small sample.

Table 10

PERCENT RESPONDING YES TO INCREASE IN STATE FISHING LICENSE FEE, BY AMOUNT SPECIFIED ON SURVEY FORM

Amount	Percent
$ 0.50	87%
1.00	79
2.00	80
5.00	64
10.00	67

Table 11 presents the results of a logit model predicting a positive response to the fishing referendum question. The observed dependent variable in the model is the yes-or-no response to an increase in the fishing license fee to continue the CCC's salmon restoration work. The explanatory variables are the amount specified for the fee increase, the income, sex, age, times fishing per year and years in the sport for each respondent, and the location where the interview took place.

Table 11

RESULTS FROM LOGIT MODEL PREDICTING

RESPONSE TO SALMON RESTORATION REFERENDUM

Constant	.11
Price	-.13
Female	-1.76*
Age 35 to 64	.35
Age 65 and up	-.58
Income	.01
Times Fishing per Year	.01
Years Fishing	-.00
Boat	1.24*
Klamuth River	.57
Eel River	1.27
Chi-Squared	18.06
Sample size	115

*Indicates Statistically Significant at the .05 level.

Note: Thirty-six observations were deleted in the logit analysis due to missing data points.

As in the trail survey, logit results make it possible to estimate the willingness of salmon fishermen to pay to support the CCC's work. This comes out to $5.60 for the average person in the sample. This figure varies somewhat depending on whether the individual was fishing from a boat or the shore and on which river the interview took place. The average person fishing from a boat was willing to pay $6.90 to support the CCC's salmon restoration work, while the average shore fisherman was willing to pay $4.50. Average willingness-to-pay varied from $3.14 for Sacramento River interviews to $8.09 for Eel River interviews. Generalized to the population of 240,800 salmon and steelhead trout fishermen in California, we estimate that sport fishermen would be willing to pay $1,348,480 to support the CCC's salmon restoration work.

Value/Cost Estimates

Apportioning costs to CCC work categories is mainly a matter of multiplying total CCC costs by the proportion of work-hours spent on each category. To these costs must be added the complementary

costs of work sponsors. Estimates of work sponsor costs, by category, are available from CCC project completion forms. Somewhat complicating this cost-apportioning is the fact that the CCC spends 18 percent of corpsmember work-hours on program support and capital improvement projects for the program itself and 13 percent of corpsmember work-hours on training. Hours for program support and capital improvement are allocated to other CCC work categories in proportion to their share of program hours. Because much of the CCC's training is geared to preparing for emergencies, the corpsmembers' training hours are allocated to the two work categories of wildland fire control and general emergency response.

Table 12 presents benefits of the CCC's various work categories as estimated from the surveys, cost-of-work estimates and value/cost ratios.

Table 12

VALUES, COSTS AND BENEFIT/COST RATIOS OF THE CCC WORK PROGRAM, BY CATEGORY

	Values[1]	Costs[2]	V/C Ratio
Trail Work	$50M	$3.3M	15:1
Forest Work	36	9.2	4:1
Park Development	41	7.0	6:1
Fire Control	31	6.2	5:1
Construction Work	28	5.0	6:1
Wildlife Habitat			
Erosion Control	47	2.8	17:1
Salmon Restoration[3]	37	2.1	18:1
Emergency Response	34	5.8	6:1
Energy and Solar[4]	6	2.2	3:1
Total	$310M	$43.6M	7:1

1. Values are estimates from the trail survey and fishing survey.

2. Costs include both CCC program costs and sponsoring agency costs.

3. Values of salmon restoration include results from the trail survey and fishing survey added together.

4. Values from energy conservation and solar energy work are resulting energy savings estimated by the CCC. Energy and solar work was not included in the trail survey as value can be directly measured.

As is clear in Table 12, the survey results yield value/cost ratios that are quite startling. Overall, the survey results suggest a value/cost ratio of 7:1 for the CCC's work programs.

The survey results indicate that an average individual involved in outdoor recreation in California would be willing to pay $108 each year to support the work of the CCC. An average sport fishermen would be willing to pay $5. If these results are extrapolated to all California residents, not just users of parks and waters, it means that every California taxpayer would be willing to pay $18.44 to support the work of the CCC.

This is more support than expected, but certainly it is within reason for a group of individuals who have strong concern for the environment and who tend to be of at least moderate income. Further, it is not particularly surprising in environmental economics to find that people are willing to pay several times over what one would expect for a good or service. In the study of Wisconsin duck hunters cited earlier, the average hunter turned down an offer of $30 for a permit, and 13 percent of hunters who were offered $200 for their permits returned the checks rather than the license.

Similarly, it not extraordinary for a good or service to be valued at many times its cost. Various public health measures, such as immunizations and clean water, have benefits many times over their costs. Basically, any good or service that is constructive and for which there are few substitutes but whose cost is moderate will have value to society several magnitudes greater than its cost.

As has been stressed throughout this report, results using an environmental economics methodology should be interpreted broadly, rather than as precise estimates. The research design selected includes facets that could cause both overestimates and underestimates of the value of the CCC's work.

There are a number of ways that overestimates may have been produced. Respondents may have misunderstood the CCC's sometimes limited role in environmental activities; they may have given socially desirable responses, and their actual willingness-to-pay may be different from their stated willingness-to-pay. In addition, there is some evidence that the survey included a disproportionate number of avid hikers, backpackers and fishermen. The number of respondents who voted "yes" to all eight referendum questions provides an indication of how serious these biases are. About half of the respondents voted to support all CCC work categories. This suggests that response bias cannot be ruled out. At the same time, it is not so pervasive as to invalidate the analysis.

The main facet of the research design that could lead to underestimates of the value of the CCC's work is that the analysis assumes there is no willingness-to-pay among the 86.3 percent of the California population who do not hike or backpack. No doubt there is some residual willingness to pay among these people to support the CCC's work.

Finally, because the sample was not drawn with a known probability from some larger group, it is impossible to know how precisely survey estimates mirror willingness-to-pay in the total population.

Conclusion

The research reported here is an attempt to apply the principles and techniques of environmental economics to a valuation of a youth conservation corps. To the best of our knowledge, this is the first time this approach has been used for this purpose. Much thought and care went into the study; nonetheless, there are many ways it could be improved.

If the study were to be replicated, one would want to refine the questionnaire to eliminate potential sources of bias. For example, one would test alternative wordings of work descriptions to see that they accurately convey the CCC's role and to make sure they neither support nor denigrate the work. Because it is so difficult to do this, one might calculate the demand for all of the work done in an environmental entity, such as a park or lake, and then assume that the benefit attributable to the CCC was proportionate to its share of the work-hours spent on that entity during the year. Comparing the estimate derived in this fashion against the one reported here might point to the extent respondents were able to value the CCC's share of the work accomplished.

In addition, one would want a larger and more representative sample. Ideally, the sample would be of all California residents so that generalizations would be straightforward. Short of this, one would like to draw respondents with a known probability from the universe to which generalizations are being made, and then to weight the data appropriately.

Overall, it is not claimed that the results of this study indicate that the value of the CCC's work is exactly seven times the cost of the program. Rather, the results here indicate that, at least based on surveys, individuals utilizing available outdoor recreation in California appear to place great value on the type of work projects done by the CCC, to the extent that they say they are willing to pay to support the CCC in sufficient amounts to cover the costs of the program several items over. If one generalizes from the sample, it appears that among the people who

use public lands and waters there is support for the environmental work that the CCC does. The value of the work to this group alone is sufficient to create a value/cost ratio much greater than one.